DOCUMENT RESUME

ED 105 269 CE 003 577

AUTHOR	Day, Gerald R., Comp.; Herschbach, Dennis R., Comp.
TITLE	Resource Guide for Performance-Based Carpentry Instruction.
INSTITUTION	Maryland Univ., College Park. Bureau of Educational Research and Field Services.
SPONS AGENCY	Maryland State Dept. of Education, Baltimore. Div. of Vocational-Technical Education.
PUB DATE	74
NOTE	95p.
EDRS PRICE	MF-$0.76 HC-$4.43 PLUS POSTAGE
DESCRIPTORS	*Annotated Bibliographies; *Carpenters; Curriculum Guides; Job Skills; *Occupational Information; Performance Based Education; *Resource Guides; *Task Analysis; Trade and Industrial Education

ABSTRACT

The guide provides current information about the carpentry field, opening with occupational information relating to descriptive terms for carpentry and woodcraft activities taken directly from the Dictionary of Occupational Titles. Curriculum materials information incorporates a carpentry task inventory check list developed by The Ohio State University. Three carpentry task analyses are also included. An article, reprinted from the American Vocational Journal, titled "A Modular Approach to Vocational Curriculum" describes an approach recommended by the editors. Modular course materials include a course outline for carpentry, along with a course outline worksheet and training achievement record forms. Curriculum resources include: an evaluatively annotated list of curriculum guides, texts, and reports; a list of carpentry-related books, alphabetized by title; and a list with addresses of publication sources for carpentry materials. (SD)

ED105269

Resource Guide For Performance-Based CARPENTRY Instruction

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The development of this resource guide was made possible through a grant by the Maryland State Department of Education, Division of Vocational-Technical Education.

The Bureau of Educational Research and Field Services
College of Education, University of Maryland

1974

CE 003 577

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acknowledgements

This project was made possible through a grant by the Maryland State Department of Education, Division of Vocational-Technical Education, whose support is gratefully appreciated. A special note of thanks is expressed to Dr. Robert Laird, Trade and Industry Specialist of the Maryland State Department of Education, for his continual support and assistance in developing this guide.

Appreciation is also expressed to the many individuals and organizations who freely gave of their time and effort, among them:

Dr. Harry L. Ammerman, Research Specialist
The Center for Vocational and Technical Education
Columbus, Ohio

Mr. Fred Harrington, Coordinator
for Curriculum Development
West Virginia Department of Education
Charleston, West Virginia

Mr. Ben A. Hirst, Jr., Director
Vocational-Technical Education Consortium of States
Atlanta, Georgia

Ms. Lynne S. Mayer
West Virginia Research Coordinating Unit
for Vocational Education
Charleston, West Virginia

Dr. Frank Pratzner, Program Director
Methods for Curriculum Content Derivation
The Center for Vocational and Technical Education
Columbus, Ohio

Mr. James Rushton
Manpower Development and Training Department
National Association of Home Builders
Washington, D. C.

Mr. Robert Spillman, Director
Personnel Development Unit
V-TECS Project
Frankfort, Kentucky

Mr. Gilbert Boschert, carpentry instructor at Eastern Vocational-Technical Center, and Mr. Kenneth Barnes, carpentry teacher at Dorchester County Vocational-Technical

Center served as consultants, and their assistance is highly appreciated.

Finally, gratitude is expressed to Mrs. Joan Schwanger and the Industrial Education Department's secretarial staff for their assistance, and to Mrs. Bonnie Dunn for the final typing.

preface

A perennial problem in curriculum development which has direct impact on everyday classroom instruction is the determination of what should be taught. Moreover, in vocational education, this problem takes on an added dimension. If an occupational field were to remain stabilized in terms of invention, technique, and specialization, few changes would be anticipated, and the instructional development process would be greatly simplified. However, there are few occupational fields which are not experiencing rapid, if not almost continual change, and this fact is particularly true of carpentry.

It is not enough to simply identify and select for inclusion in the instructional program the skills and knowledge a carpenter has needed in the past. The rapid pace of technological and occupational change necessitates frequent and almost continual upgrading and restructuring of the instructional program. Then too, specialization requires a depth of training on the part of the student not formerly required, especially in light of technical innovation. Concurrently, the teacher must have a working knowledge of an ever-expanding field of knowledge, but because he is sometimes isolated from the work situation he may not be in the best position to gain access to newer developments.

This resource guide is designed to assist the classroom teacher in keeping abreast of the most recent developments in carpentry instruction. The information included is the most current, and it has been identified and validated by incumbent workers, trade unions, professional organizations, and teachers. The aim of this guide is to provide the teacher with resource materials which he can examine, select, modify and integrate into his own instructional format. In this way, it is hoped that the very important task of program up-grading can be facilitated.

USE OF THE GUIDE

This resource guide was prepared to assist curriculum specialists, administrators, supervisors and, above all, teachers in the planning and development of a performance-based carpentry program. Section two contains occupational information which can be useful inasmuch as it can complement technical instruction and serve as a source of guidance information. The third section contains curriculum materials, including a carpentry task inventory, task analyses, training achievement records, and modular curriculum materials which were collected from various agencies, schools, state departments of education, and other organizations. Recent curriculum projects, guides, reports, and carpentry training programs are annotated in the third section. A list of carpentry and related books is included in the final section. The material in these sections can be used as the basis for the development of a modular, performance-based carpentry program.

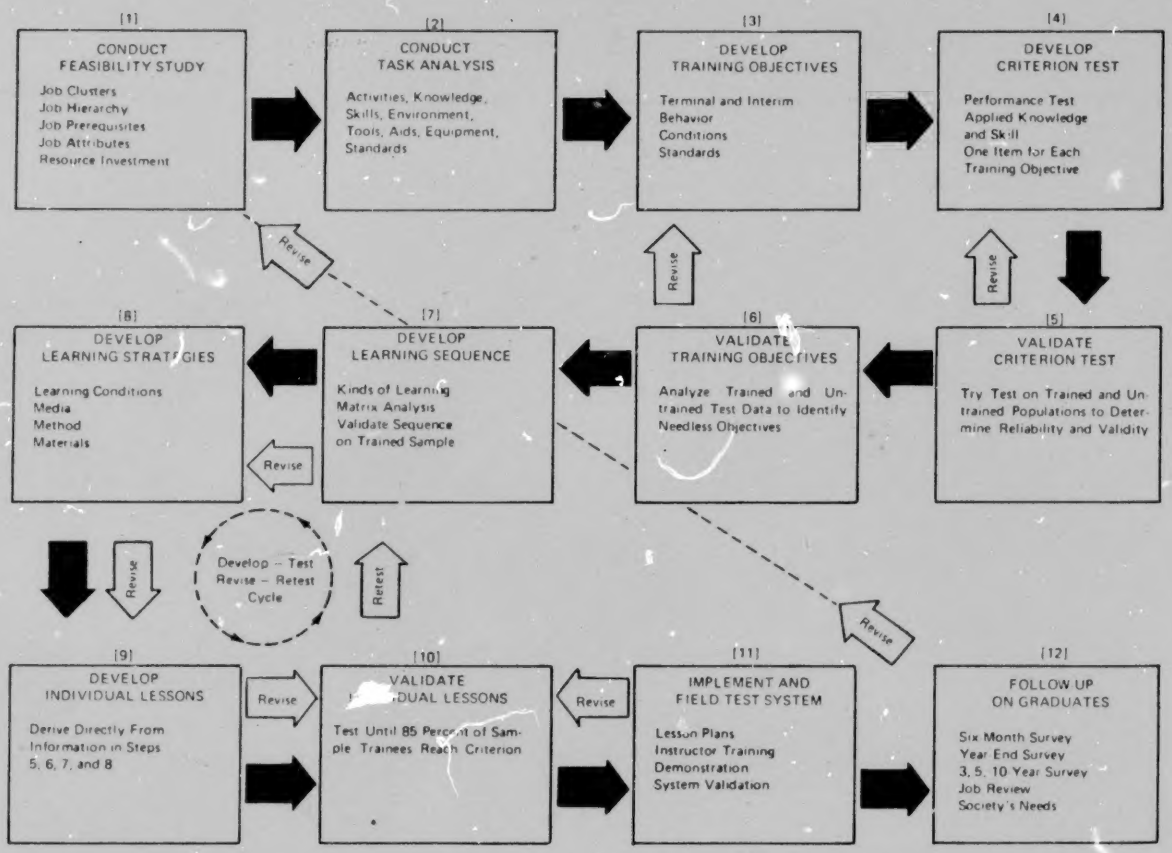
The purpose of this guide, however, is not to tell the carpentry instructor how to teach, but rather to aid him in up-grading his course by providing access to the most current instructional materials available. The local educational agency must make the choice as to how to structure the instructional program based on the availability of physical plant and equipment, characteristics of the student population served, scheduling procedures, instructor's training, local occupational needs, and other variables. Similarly, each individual teacher should strive to achieve an instructional blend that is most appropriate to the needs of his classroom situation. Accordingly, every effort has been made to develop a format and include resources which would contribute toward the development of a flexible guide that could be used in a number of instructional settings.

This guide, then, indicates current developments in the area of carpentry instruction--developments, moreover, that the instructor should examine as they represent the leading efforts throughout the United States. In this way, the instructor is provided with check points with which to compare his own program features. Current instructional strategies include behavioral or performance objectives, modular curriculum construction, open-entry programs, articulation between secondary and post-secondary programs, learning packets, computer usage, and criterion-referenced measurement. In short, performance is the key word in today's curriculum development.

There are a number of practical points which the individual should keep in mind when using this guide:

1. Every effort should be made to collect and examine curriculum materials which are appropriate. Not only can a great deal of duplicated effort be avoided by utilizing existing information, but an understanding of the current state-of-the-art provides a solid foundation on which to structure program development.

2. Instructional development should be considered an on-going process, not a one-time effort. This process, moreover, can be simplified by using a systematic plan for developing and evaluating the instructional plan. Many of the curriculum resources in this guide have successfully used system approaches to curriculum development. It is suggested that each school develop a system which will work in its situation. The following is one such example that has been developed by Butler in Instructional Systems Development for Vocational and Technical Training.



Flow Chart of Training System Development Process

3. It is suggested that program development be approached through the use of committees. Committees can provide a forum for discussion and a means of obtaining feedback on ideas. They also have an advantage over individual effort inasmuch as the work load can be shared.

4. Finally, a resource curriculum center can be a useful tool in curriculum development. It would be advantageous to establish a center which would serve as a central place to collect curriculum materials, as well as a convenient work place. The curriculum center in the Industrial Education Department at the University of Maryland, as well as the Curriculum Dissemination Center in Allegany County Vocational Technical Center, is available to individuals who are working on curriculum development.

OCCUPATIONAL INFORMATION

The occupational information in this section can be useful to the classroom teacher in the following ways:

1) It can serve as a source of reference information from which to develop instructional materials.

2) It can provide career information to students.

3) It can be used to develop public relations and course description materials for use by school counselors, parents, and other interested individuals.

With today's emphasis on career education, vocational education teachers should be well informed with regard to their particular field. Similarly, in order for students to make realistic career choices, they must know the qualifications, working conditions, employment outlook, required job-entry tasks, and other career-related information of the occupation. It is not enough to leave the vital career facts of an occupational field to chance exposure.

The material that follows provides basic information that carpentry instructors can use to convey an understanding of different occupational aspects of the field of carpentry and woodworking. This information should be supplemented with field trips, guest lectures, career days, and other occupational and guidance information.

The information in this section can also be used to develop materials for an area that is often overlooked, namely, public information. Students would often like to know about a field of study before they take courses. Parents want to know the occupational opportunities available to their children, and school counselors are required to provide current occupational information to students. The information in this section can be used to develop such descriptive materials in the form of booklets, course descriptions, and career information sheets.

Nature of the Work

Carpenters, who comprise the largest group of workers in the building trades, are employed in almost every type

of construction activity. Carpenters and associated workers are on the job site from the time ground is broken until painters and decorators move out and the tenant moves in. Carpenters set shoring in tunnels, trenches, and open excavations, build and install wooden forms to contain fluid concrete, and erect scaffolding to provide working access above the ground level. They also erect wooden structures using materials that form foundations, floors, walls, partitions, and roofs, and install roofing and siding materials. Carpenters install windows and door units, interior wall coverings, as well as trim and molding. They fabricate and install a variety of cabinets, fixtures, and furniture. After the structure is completed, carpenters maintain, repair, and remodel. When the structure is no longer useful and is demolished, carpenters are found in the wrecking crew.

The work performed by the carpenter depends on the location in which he works. Because of the wide range of tasks performed in the trade, some carpenters specialize in a particular area. For example, some specialize in the installation of acoustical materials, while others are skilled in the installation of finishing hardware. With the increase in commercial building, carpenters are specializing in building forms needed to pour concrete decks, columns, piers, and retaining walls used in bridges, buildings, and other structures.

Specialization is more common in urban settings or on large construction projects. In small towns and rural areas, carpenters may perform all phases of carpentry, including painting, glazing, and roofing.

In general, carpenters usually stay in a particular field such as home, bridge, commercial or highway construction.

Working Conditions

The work of the carpenter is active and sometimes strenuous, but exceptional physical strength is not required. Prolonged standing, as well as climbing and squatting, is often necessary. Good physical condition, a good sense of balance, and manual dexterity are important. The carpenter works both inside and outside in heat and cold and is subject to extreme temperature changes. The work may be performed under wet or humid conditions and job conditions may be noisy. Carpenters risk injury from slips and falls, from contact with sharp or rough material, and from the use of sharp tools and power equipment. Work may be performed in locations subject to fumes, odors, dust, poor ventilation, or toxic conditions.

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Classification of Carpenters

There are basically two ways of classifying carpentry work. One is to break the tasks into "rough" carpentry and "finish" carpentry. The rough carpenter erects the wood framework in buildings (including subflooring, sheathing, partitions, floor joists, studding, and rafters), and installs heavy timbers used in the building of docks, railroad trestles, and similar heavy installations. The finish carpenter installs molding around floors and ceilings, wood paneling, cabinets, window sashes, door frames, builds stairs, and lays floors.

Another way to classify carpentry work is to divide it into residential and commercial work. The residential carpenter works on homes, whereas the commercial carpenter works on commercial, industrial, and institutional buildings, bridges, highways and other similar projects. The field of commercial carpentry is growing at a rapid rate and should continue as the pace of urbanization accelerates.

Places of Employment

Of the over 1 million carpenters, the majority are employed by construction firms, contractors, and home builders. Most work in building construction, although some work on bridges, highways, and other non-building structures. A substantial number alter, remodel, or repair buildings. Carpenters sometimes alternate their work load between contractors and self-employment. Some carpenters do maintenance work in factories, hotels, and office buildings, while others work for governmental agencies and non-construction firms which employ their own separate work force to do their construction work. Others are employed in shipbuilding, mining, and in the production of display materials such as signs and billboards.

Training, Qualifications, and Advancement

Although many carpenters learn the trade informally on the job, it is generally agreed by training authorities that the trade is best learned by serving an apprenticeship under the guidance of journeyman carpenters on the job site, backed up by related courses in the classroom. The program usually covers a four-year period. Apprenticeship applicants should be at least 17 years old, in good physical condition, possess good finger and manual dexterity, physical strength, mechanical aptitude, form perception, and possess a high school diploma.

The starting hourly wage for apprentices varies according to location, but it is usually about 55% of the

journeyman's rate and increases by about 5% in each six-month period until a rate of 85 to 90% is reached.

The National Association of Home Builders has developed Incentive Apprenticeship Training for carpentry. This training program allows an individual to complete an apprenticeship program in less than four years by taking a series of manipulative and written tests. Thus, many individuals with outstanding aptitude for carpentry can shorten the time of apprenticeship by demonstrating their abilities on the job and passing certified tests given by journeymen in an organization. It also helps the trainee to decide in which areas of carpentry he should specialize.

The normal line of promotion is advancement to carpenter foreman or general construction foreman. Some carpenters may go into business for themselves and become contractors of new construction or remodeling work.

Employment Outlook

The Occupational Outlook Handbook has stated that the demand for trained carpenters during the 1970's and 1980's will be good. In addition to new jobs created by employment growth, tens of thousands of jobs will be available each year to replace experienced carpenters who transfer to other fields, retire, or die. The United Brotherhood of Carpenters and Joiners of America and the National Association of Home Builders also project a growing demand for carpenters on building sites and in maintenance work.

D.O.T. Job Descriptions

The Dictionary of Occupational Titles contains many job titles and descriptions of those involved in carpentry and woodcraft activities. It is obvious that many of the woodcraft job titles and work tasks overlap. The area of the country as well as tradition play an important role in the complete definition of what tasks a particular worker will perform. The following is a general presentation of some of the more common job classifications related to carpentry:

> Carpenter Foreman (860.131): Supervises and coordinates activities of workers engaged in construction, installation, and repair of wooden structures and fixtures. Examines blueprints, lays out, selects materials, determines sequence of activities, assigns workers, inspects work performed by subcontractors. May make cost and time estimates. Usually employed by a contractor or establishment and is in direct contact with workers on construction site. Requires great deal of experience in the particular type of construction he

is involved in. Generally has spent quite some time as a worker actually performing tasks required and has the ability to supervise people. Depending on type of construction, may be in charge of large number of people and many dollars' worth of material and equipment. May be working or non-working, depending upon company policy.

Cofferdam-Construction Foreman (860.131): Has direct contact with carpenters actually involved in construction of cofferdam in area of dam site. Works from blueprints to determine materials, equipment, job assignments, and any other coordination necessary to assure proper sequencing of operations. Usually has charge of pile-driving and shoring. Must have considerable experience and knowledge of blueprints, materials, methods and be able to handle people.

Form-Building Foreman (860.131): Supervises carpenters and expediting of materials required for construction of wooden forms to mold concrete. May work in shop or directly on job site. Requires vast experience in material characteristics and methods of assembly. Must be able to read blueprints and have enough imagination to be able to instruct carpenters how to construct forms. May lay out with rule, tape, plumb, level and transit.

Timbering Foreman (860.131): Supervises and coordinates activities of rough carpenters engaged in construction or installation of structures or shoring with heavy planks or posts (timbers). May be in charge of workers driving piling or doing shoring activities. Requires knowledge of pile driving equipment and mechanical properties of material. Usually has considerable experience on heavy construction involving earth moving and concrete.

Carpenter-Labor Foreman (860.131): Supervises and coordinates activities of workers engaged in supplying materials to workers who construct, erect, install and repair wooden structures and fixtures. Directs work crew to strip forms and dismantle wooden structures. Supervises workers engaged in pouring concrete. Usually employed by contractor or establishment large enough to warrant a foreman for carpenters and another for laborers. Usually reads blueprints to determine proper sequencing of worker and material operations.

Carpenter, Construction (860.381): Constructs, erects, installs and repairs structures and fixtures of wood, plywood, and wallboard (using carpenter's hand tools, and conforming to local building codes). Studies blueprints, sketches, or building plans for information pertaining to type of material required (such as lumber

or fiberboard, and dimensions of structure or fixture to be fabricated). Selects specified type of lumber or other materials. Prepares layout, using rule, framing square and calipers. Marks cutting and assembly lines or materials, using pencil, chalk, and marking gage. Shapes materials to prescribed measurements, using saws, chisels, and planes. Assembles cut and shaped materials and fastens them together with nails, dowel pins or glue. Verifies trueness of structure with plumb bob and carpenter's level. Erects framework for structures and lays subflooring. Builds stairs and lays out and installs partitions and cabinet work. Covers subfloor with building paper to keep out moisture and lays hardwood, parquet, and wood-strip-block floors by nailing floors to subfloor or cementing them to mastic or asphalt base. Applies shock-absorbing, sound-deadening and decorative paneling to ceilings and walls. Fits and installs prefabricated window frames, doors, doorframes, weather stripping, interior and exterior trim, and finish hardware, such as locks, letter drops, and kick plates. Constructs concrete forms and pouring chutes. Erects scaffolding and ladders for assembling structures above ground level. May weld metal parts to steel structural members.

Carpenter, Maintenance (860.281): Constructs and repairs structural woodwork and equipment in an establishment, or as self-employed, working from blueprints, drawings or verbal instructions. Builds, repairs, and installs counters, cabinets, benches, partitions, floors, doors, building framework, and trim. Replaces ceiling tile, floor tile, and sheet plastic wall coverings, window shades, or Venetian blinds. Uses hand tools and power tools required. Work is usually neat and well done. Depending on the type of work being done, may become involved in repair jobs which require skills of other trades such as glazing or painting.

Carpenter, Hotel (860.131): Repairs fixtures, doors, windows, elevators, ceilings, floors, and remodels as required. Work must be high quality and neat appearing. May become involved in some heavy structural work but usually repairs broken or worn pieces.

Carpenter, Mill (860.131): Works from blueprints, sketches, or verbal instructions to select materials, construct, and install cabinets, counters, decorative store fronts, and furniture. Usually works in a shop and sets up and operates a variety of woodworking machines to surface, cut, and shape lumber, and to fabricate parts for wood products, such as doors, door and window frames. Many are self-employed and others work for contractors or establishments. May make cost and time estimates required for contract bidding.

Carpenter, House (860.131): Constructs and sets forms for foundation, builds structural skeleton, sheetrocks, decks, lays shingles, lays flooring, sometimes builds cabinets, and does decorative woodwork inside and outside. Works primarily with hand tools and some power tools in order to shape materials to required sizes. May be self-employed or be employed by contractor. Sometimes specializes in a particular phase of house construction such as Framing Carpenter, Sheetrocker, or Shingle Layer.

Carpenter, Refrigerator (860.131): Performs carpentry in construction of walk-in freezers and environmental test chambers. Installs forms for foundation requirements of machinery. Usually self-employed or employed by firm whose only business is hignly specialized. Uses hand and power tools to shape various materials.

Carpenter, Finish (860.131): Installs molding and sets trim. Panels walls and partitions. May lay out and construct cabinets, counters, and decorative wooden structures. Workmanship must be of high quality. Hangs prefabricated door and window units, sets locks, installs weather stripping. May specialize in one or more types of construction such as door hanger, garage door hanger, hardwood-floor layer, jalousie installer, or stair builder.

Carpenter, Bridge (860.381): Constructs, erects, installs, and repairs bridges, trestles, and tunnel supports.

Carpenter, Acoustical (860.131): Mounts acoustical tile to walls and ceilings of residential and commercial buildings. Installs metal tile lathing.

Carpenter, Building-Insulating (860.131): Removes sections of walls, roofs, and floors, or cuts apertures in structures to facilitate installation of insulating materials.

Carpenter, Form Builder (860.781): Works in shop or on construction site constructing wooden forms for molding concrete. Studies blueprints or follows verbal instructions to determine size and shape of forms. Uses hand tools and power tools.

Carpenter, Form Setter (860.781): Installs forms on construction site and provides necessary supports and braces so forms will not shift when concrete is poured.

Carpenter, Rough (860.781): Builds rough wooden structures, such as concrete forms, scaffolds, tunnel and sewer supports and temporary frame shelters according to sketches and oral instructions. Examines specifications to determine dimensions of structures, measures boards, timbers or plywood using a square, measuring tape and ruler and marks cutting lines on materials, using a pencil and scriber. Saws boards and plywood panels to required sizes. Nails cleats (braces) across boards to construct concrete forms. Braces forms in place with timbers, tie rods and anchor bolts for use in building concrete piers, footings and walls. Installs door and window bucks (rough frames in which finished frames are inserted) in designated positions in building framework. Installs subfloors in buildings. Nails plaster grounds (wooden or metal strips) to studding to provide a guide for buildings.

Carpenter, Packing (920.884): Fabricates wooden crates or boxes using woodworking hand tools and power tools, and packs machinery, vehicles, or other large or odd shaped products. Reads blueprints, shipping notices, and other specifications, and inspects product to determine size and shape of container.

Carpenter, Shorer (860.884): Erects timbers, cross braces, and sheeting for temporary retaining walls to support sidewalls of trenches and open excavations.

Asbestos-Shingle Roofer: Measures, cuts, and nails into place asbestos siding products.

Bandsaw Operator (667.885): Tends bandsaw that cuts wooden stock. Stacks pieces of stock on cutting table against preset ripping fence. Pushes cutting table against saw until stock is severed.

Band-Scroll-Saw Operator (667.782): Operates bandsaw to saw curved or irregular designs on wooden stock. Installs jigs and attachments to rip stock to size.

Batterboard Setter (851.884): Positions batterboards (horizontal boards used in construction to indicate desired levels and for attaching string to mark grades) to indicate direction of power shovel or trenching machine. Determines height of batterboard from engineering data. May signal equipment operator to correct discrepancies.

Laborer, Carpentry (860.887): Assists carpenter to build wooden structures. Selects and saws lumber to specified size. Holds lumber in position for nailing by carpenter. Nails sheeting to studs after structure has been framed. Cleans used lumber and wooden and

metal forms. Removes shoring and bracing from forms, and dismantles and stacks them. Oils metal forms. Conveys materials and tools about job site.

Carpenter Helper, Hardwood Flooring (860.781): Assists in laying hardwood flooring on subfloor surface.

Laborer, Pile Driving, Ground Work (850.887): Assists pile driving leadsman to erect piles and sheet piling for use in building structural foundations, retaining walls, and cofferdams. Cleans piling, using shovel or ax. Trims and points wooden piles or sheeting and tapers butt of wooden piles to fit piledriver hammer, using adz or ax.

Cabinetmaker (660.280): Constructs and repairs wooden articles, such as store fixtures, office equipment, cabinets, and high grade furniture. Sets up and operates such woodworking machines as power saw, jointer, mortiser, tenoner, molder, and shaper to cut and shape parts.

Floorlayer (864.781): Applies blocks, strips or sheets of shock-absorbing, sound-deadening, or decorative covering to floors, walls, and cabinets. Spreads adhesive cement over floor and lays covering on floor following guidelines.

Insulation Worker (863.884): Applies insulating material to exposed surfaces of equipment such as boilers, tanks, hot-or-cold air ducts, or pipes, and steam generators. May cover pipe with felt which is bound with wire, or gauze which is covered with plaster of paris.

Insulation Installer (863.884): Fastens sheets, bat, blanket, and similar types of building insulation to walls, floors, ceilings, and partitions to prevent or reduce passage of heat, cold or sound. Fastens insulation to joists, rafters, studs, or furring strips. May fasten furring strips to walls, ceilings, or partitions to provide nailing base for insulation.

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CURRICULUM MATERIALS

Relevant job content, and, in turn, vocational education curricula, can be identified by means of task inventories, task analyses, and other job performance data. Within recent years, many state education departments, educators, professional organizations, trade unions, and curriculum specialists have begun to realize that there is a need to focus on what should actually be taught in vocational education programs.

This section contains information which will provide guidance to develop a performance-based carpentry curriculum. A carpentry task inventory, task analyses, training achievement records, a modular curriculum worksheet, and an example of a modular course outline are included. These can be used to develop first, a modular course outline, and then performance objectives, learning activities packets, and other instructional aids.

The task inventory is included as an example of how a task analysis is derived , in addition to providing a guide for one to construct such an inventory. The three task analyses can be used to generate a modular course outline that will ensure that students will possess entry-level skills needed for employment.

An article entitled, "A Modular Approach to Vocational Curriculum" contained in this section explains one method by which a modular-type curriculum can be developed. A modular curriculum, if well-designed, facilitates the development of individualized instruction and an open-entry program since the student can work independently and progress at his or her own rate.

A sample modular curriculum work sheet which can be used to develop a modular course outline is included, along with a sample modular course outline developed by Mr. Gilbert Boschert, carpentry teacher at Eastern Vocational-Technical Center in Essex, Maryland.

It is suggested that the training achievement records be used as examples to develop one for your school's carpentry program. These forms are being used more and more as they give an accurate record as to what the student can actually do. It is more meaningful for a prospective employer to evaluate such a record in comparison to a grade or the knowledge that the student has completed a carpentry program in high school.

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It is hoped that classroom teachers, with the aid of advisory committees, craft committees, and supervisors will develop their own carpentry curriculum based on the following section. These materials should act as a valid guide as to what entry-level tasks students should be able to perform.

CARPENTRY TASK INVENTORY

Once a feasibility study has been completed and the decision has been made to develop a certain training area, the next step in the process is to find out what should be taught. One research tool that can be used is the task inventory which can identify significant tasks and worker requirements within a certain occupation. Although there are many job inventory methods, including the questionnaire, individual interview, observation interview, group interview, daily diary, and work participation, the check list task inventory is probably the method most commonly used.

The check list task inventory is a survey instrument usually sent to incumbent workers and/or employers that can be used to identify job-entry tasks, tasks important for promotion, task frequency, level of proficiency, and other information. The inventory is first constructed from data obtained from currently published occupational literature, professional associations, trade unions, government agencies, and other resources. From a comprehensive list of performance tasks listed on the inventory the incumbent workers and/or employer selects those which are deemed necessary for entry-level employment. The results of the task inventory are analyzed and synthesized and a task analysis is generated.

The following carpentry task inventory was developed by The Ohio State University.

CARPENTRY TASK INVENTORY, Technical and Industrial Education Materials Laboratory, College of Education, The Ohio State University.

Circle the number which indicates how often you perform the task.	Never	Yearly	Monthly	Weekly	Daily
Foundations					
1. Locate building lines	0	1	2	3	4
2. Square with level-transit	0	1	2	3	4
3. Erect batter boards	0	1	2	3	4
4. Locate footings	0	1	2	3	4
5. Concrete form construction	0	1	2	3	4
6. Concrete wall and form erection	0	1	2	3	4
7. Install anchoring devices in masonry walls	0	1	2	3	4
8. Locate openings in masonry walls	0	1	2	3	4
9. Prepare for back sill	0	1	2	3	4
10. Place concrete floors and sidewalks	0	1	2	3	4
Floor Framing					
1. Prepare foundations for sill	0	1	2	3	4
2. Cut and install sill	0	1	2	3	4
3. Cut and assemble build-up	0	1	2	3	4
4. Erect and support girder	0	1	2	3	4
5. Prepare girder for floor	0	1	2	3	4
6. Lay out sill for floor joists	0	1	2	3	4
7. Install floor joist	0	1	2	3	4
8. Openings in floor joists	0	1	2	3	4
9. Cut wood cross bridging	0	1	2	3	4
10. Install wood cross bridging	0	1	2	3	4
11. Install plywood sub-floor	0	1	2	3	4
12. Install strip flooring	0	1	2	3	4
Wall Framing					
1. Lay out and cut plates	0	1	2	3	4
2. Lay out wall openings	0	1	2	3	4
3. Cut and install studding	0	1	2	3	4
4. Cut and assemble wall openings	0	1	2	3	4
5. Erect walls	0	1	2	3	4
6. Plumb and brace walls	0	1	2	3	4
7. Install double plates	0	1	2	3	4
8. Install backing	0	1	2	3	4
9. Install wall sheathing	0	1	2	3	4
Roof Framing					
1. Lay out ceiling joists	0	1	2	3	4
2. Cut and install ceiling joists	0	1	2	3	4
3. Lay out and cut ridge board	0	1	2	3	4
4. Lay out and cut common rafters	0	1	2	3	4

15

		Never	Yearly	Monthly	Weekly	Daily
5.	Lay out and cut hip and valley rafters	0	1	2	3	4
6.	Lay out and cut jack rafters	0	1	2	3	4
7.	Install rafters	0	1	2	3	4
8.	Lay out gable end studding	0	1	2	3	4
9.	Plumb and brace rafters	0	1	2	3	4
10.	Cut and install collar beams	0	1	2	3	4
11.	Align rafters	0	1	2	3	4
12.	Install roofsheathing	0	1	2	3	4
13.	Truss roof layout	0	1	2	3	4
	Roofing					
1.	Install felt building paper	0	1	2	3	4
2.	Install roll roofing	0	1	2	3	4
3.	Prepare valley (valley preparation)	0	1	2	3	4
4.	Install flashing	0	1	2	3	4
5.	Apply asphalt roofing	0	1	2	3	4
6.	Apply valley	0	1	2	3	4
7.	Roof caps and louvers	0	1	2	3	4
8.	Apply metal roofing	0	1	2	3	4
	Exterior Finish					
1.	Install windows	0	1	2	3	4
2.	Install exterior door jambs	0	1	2	3	4
3.	Cut and install fasica	0	1	2	3	4
4.	Install ledger board and lookouts	0	1	2	3	4
5.	Install aluminum soffit	0	1	2	3	4
6.	Install wood and composition	0	1	2	3	4
7.	Install frieze board	0	1	2	3	4
8.	Install exterior moldings	0	1	2	3	4
9.	Cut and install roof vents	0	1	2	3	4
10.	Apply aluminum and vinyl	0	1	2	3	4
11.	Apply bevel siding	0	1	2	3	4
12.	Apply board and batten siding	0	1	2	3	4
13.	Apply cedar shake siding	0	1	2	3	4
14.	Apply gutters	0	1	2	3	4
	Interior Finish					
1.	Apply gypsum lath	0	1	2	3	4
2.	Apply gypsum wallboard	0	1	2	3	4
3.	Apply vertical wall panels	0	1	2	3	4
4.	Install composition ceiling	0	1	2	3	4
5.	Apply underlayment	0	1	2	3	4
6.	Cut and assemble door jambs	0	1	2	3	4
7.	Install door jamb	0	1	2	3	4
8.	Cut, fit, and install door stop and casing	0	1	2	3	4
9.	Fit hinge interior and exterior doors	0	1	2	3	4

	Never	Yearly	Monthly	Weekly	Daily
10. Install locks on doors	0	1	2	3	4
11. Trim a window	0	1	2	3	4
12. Cut, fit, and install hardwood flooring	0	1	2	3	4
13. Cut, fit, and install base and base shoe	0	1	2	3	4
14. Install by-pass doors	0	1	2	3	4
15. Assemble and install pocket door unit	0	1	2	3	4
16. Bi-fold door	0	1	2	3	4
17. Install accordian door	0	1	2	3	4
18. Install interior hardware	0	1	2	3	4
Insulation					
1. Install loose fill insulation	0	1	2	3	4
2. Install blanket and batt insulation	0	1	2	3	4
3. Install rigid insulation	0	1	2	3	4
4. Install vapor barriers	0	1	2	3	4
Stairway Construction					
1. Stairway string or horse layout	0	1	2	3	4
2. Cut or install string or horse	0	1	2	3	4
3. Mark, cut and install skirt board	0	1	2	3	4
4. Lay out, cut, and fit stair risers and treads.	0	1	2	3	4
5. Lay out newels, balusters, and handrails	0	1	2	3	4
6. Install newels, balusters, and handrails	0	1	2	3	4
7. Moldings	0	1	2	3	4
Cabinet Construction					
1. Unit layout of cabinets	0	1	2	3	4
2. Lay out cabinet facings	0	1	2	3	4
3. Lay out and cut end and partition panels	0	1	2	3	4
4. Lay out and cut horizontal frames	0	1	2	3	4
5. Lay out and cut shelves	0	1	2	3	4
6. Assemble basic structure	0	1	2	3	4
7. Cut, assemble and apply cabinet facing	0	1	2	3	4
8. Lay out and cut cabinet doors	0	1	2	3	4
9. Lay out and cut cabinet drawers	0	1	2	3	4
10. Assemble cabinet drawers	0	1	2	3	4
11. Install cabinet hardware	0	1	2	3	4
12. Cut, assemble, and apply counter tops	0	1	2	3	4
13. Apply plastic laminates	0	1	2	3	4
14. Openings in plastic laminates	0	1	2	3	4
15. Cut, fit, and apply back splash	0	1	2	3	4
16. Install wall units	0	1	2	3	4
17. Install base cabinets	0	1	2	3	4

CARPENTRY TASK ANALYSES

A task analysis is a basis for supplying occupational information needed for manpower development and utilization programs in industry, and in turn, educational training programs.

After the systematic collection of data on the job tasks within a certain occupation, the data is analyzed, usually by computer, and a task analysis is generated. The task analysis lists the behavioral characteristics of the job requirements within a specified occupation.

The following are three recent and valid carpentry task analyses and should be used as guides as to what should be taught in a vocational training program. As will be observed, all three are similar in their breakdown of units and tasks within each unit. They vary mainly because of the terminology used on the original task inventory. Three analyses are included to enable validation and flexibility in program development.

CARPENTRY TASK ANALYSIS, Battelle Columbus Laboratories, 1972. (Highly Recommended)

BLUEPRINTS AND SPECIFICATIONS

1. Reads and interprets dimensions.
2. Uses the working drawings in actual construction.

SITE PREPARATION AND LAYOUT

1. Suspends and squares foundation lines.
2. Erects batter boards.
3. Suspends building lines from batter boards.
4. Squares building lines at corners and checks layout for squareness.

SUPPLIES

1. Differentiates the working characteristics of types of hardwood and softwood.
2. Differentiates nominal and finished sizes of lumber and selects lumber sizes.
3. Recognizes the direction of grain in wood
4. Detects a warp and other defects in lumber.
5. Differentiates and selects various molding types.
6. Differentiates and selects plywood, gypsum board, hardboard, etc.
7. Differentiates and selects types and sizes of rough hardware (nails, screws, bolts, etc.)
8. Stores supplies as they arrive on the site so as to prevent damage.
9. Plans use of lumber in order to limit waste.

FOUNDATION CONSTRUCTION

1. Constructs concrete forms for single and repeated use.
2. Constructs forms for footings, walls, and concrete columns.

3. Constructs forms for open concrete steps and for concrete steps on sloping ground.

4. Builds forms for concrete walks and interior cellar forms.

5. Places whalers, ties, and reinforcing rods in concrete forms.

6. Damp-proofs walls.

7. Installs wood or steel columns.

FRAMING--GENERAL

1. Utilizes low grade lumber.

2. Utilizes scrap lumber.

3. Does framing, e.g., modern brace, western, platform, plank and beam, etc.

FLOOR FRAMING

1. Checks foundation for squareness.

2. Cuts and installs wood sill.

3. Constructs and installs built-up wood girders.

4. Installs steel girders or wood girders of one member.

5. Installs girders in masonry walls.

6. Installs ledger boards on girder and sills to support floor joists.

7. Installs bridle irons or joist hangers to support floor joists.

8. Cuts and installs floor joists.

9. Installs joists in masonry walls.

10. Frames floor opening for stairs, installing joist headers and trimmers and tail joists.

11. Frames floor opening for chimney, installing joist headers and trimmers and tail joists.

12. Cuts and installs wood cross bridging or other types of bridging.

13. Checks the top of the joists to see if they are in a straight line and remedies any misalignment.

14. Makes notches and holes in joists so as not to decrease strength.

15. Lays plank or plywood subflooring.

16. Lays building paper on subfloors.

WALL FRAMING AND INTERIOR PARTITIONS

1. Lays out location of partitions and walls.

2. Frames bearing and non-bearing partitions.

3. Constructs and installs exterior and interior corner posts.

4. Cuts and installs sole plates and top plates.

5. Cuts and installs studs.

6. Frames wall openings for door and windows.

7. Frames bay windows.

8. Frames openings for heating ducts and pipes.

9. Cuts and installs wall bracing.

10. Cuts and installs fire stopping.

11. Cuts and installs ceiling or second floor joists.

ROOF FRAMING

1. Constructs gable roofs.

2. Constructs hip and valley roofs.

3. Constructs gambrel roofs.

4. Construct other types of roofs (lean-to, flat, butterfly).

5. Frames intersecting roof of unequal pitch.

6. Cuts and places ridgeboard.

7. Lays out rafters by the step off method.

8. Lays out rafters by the line length method.

9. Lays out rafters by the rafter scale on the framing square.

10. Determines the run, rise, and pitch of common rafters and jack rafters.

11. Finds rough length of common rafters.

12. Lays out common rafters.

13. Makes seat cut and ridge cut on common rafters.

14. Fastens hip and valley rafters at plate and ridge.

15. Finds rough length of hip jack, valley jack, and cripple jack rafters.

16. Makes a cheek or side cut on hip jack, valley jack, and cripple jack rafters.

17. Fastens hip jack, valley jack, and cripple jack rafters.

18. Frames shed type or gable type dormer.

19. Frames opening in roof for chimney.

20. Installs rafter headers and trimmers.

21. Lays out, cuts, and installs gable studding.

22. Lays out, cuts, and installs collar beams.

23. Frames flat roof overhang.

24. Installs trussed rafters.

STAIRS

1. Constructs various types of stairways (straight, platform, closed, open).

2. Determines total rise and run of stairway.

3. Determines tread rise and run of stairway.

4. Determines the drop of the stair horse or stringer.

5. Determines amount of head room.

6. Determines length of stock for stair horse or stringer.

7. Lays out and cuts a sawed-out stair horse or stringer.

8. Lays out and constructs a built-up stair horse or stringer.

9. Installs stair horse or stringer.

10. Lays out, cuts, and installs risers.

11. Lays out, cuts, and installs treads.

12. Constructs and installs newel posts.

13. Constructs and installs balusters and fillet between balusters.

14. Constructs and installs hand rail.

15. Installs molding and trim on stairway.

16. Installs prefabricated stairs.

INSULATION

1. Installs acoustical insulation.

2. Installs thermal insulation.

3. Installs vapor barriers.

4. Installs blanket insulation.

5. Installs metallic insulation.

6. Installs ventilators.

SHEATHING

1. Installs wall and roof sheathing.

2. Installs wood board sheathing.

3. Installs plywood, fiberboard, or gypsum sheathing.

4. Installs building paper on walls and roof.

ROOFING

1. Installs asphalt or composition shingles.

2. Installs asbestos shingles.

3. Installs flashing (paper and metal).

4. Shingles up and over a dormer.

5. Shingles a valley or a hip.

6. Installs metal ridge and hip roll.

7. Builds a foot rest for shingling.

EXTERIOR TRIM

1. Constructs roof cornices.

2. Installs bevel siding with mitered corners.

3. Installs bevel siding with corner boards.

4. Installs bevel siding with metal corners.

5. Installs drop or matched siding.

6. Installs wood shingle siding.

7. Installs composition shingle siding.

8. Installs aluminum siding.

9. Installs water table.

10. Installs belt course.

11. Installs louvers for ventilators.

12. Installs flashing and weather stripping for windows.

13. Assembles and installs prefabricated window units.

14. Installs mill built screens.

15. Constructs and installs window boxes and shutters.

16. Installs flashing and weather stripping for doors.

17. Assembles and installs prefabricated door frames.

18. Fits and hangs mill built doors.

19. Installs mill built garage doors.

20. Frames and trims porch.

21. Constructs canopy or recessed front entrance.

INTERIOR TRIM

1. Installs furring strips.
2. Installs backing for handing fixtures and cabinets.
3. Installs gypsum board, fiberboard, or plywood paneling.
4. Installs acoustical ceiling.
5. Constructs beamed ceiling.
6. Installs trim and molding for walls and ceiling.
7. Assembles and installs prefabricated door frames.
8. Fits and hangs mill built doors.
9. Cuts and installs interior window trim.
10. Constructs or installs clothes chute.
11. Constructs storage partitions.
12. Builds recessed niches and shelves (built-in bookcase).
13. Constructs interiors of clothes and linen closets.
14. ~~Installs mill built cabinets.~~
15. Builds kitchen counter shelf and installs shelf surface.
16. Installs factory built medicine cabinet.
17. Builds mantel shelf.
18. Lays finish floor (hardwood and softwood).
19. Cuts and installs baseboard, base molds, and shoes.
20. Installs finish hardware (non-electric fixtures, locks, latches, knobs, etc.).
21. Installs mill built cabinets.

MISCELLANEOUS

1. Observes safety in the use of hand and power tools and on the job.
2. Constructs or erects scaffolds.

3. Cleans, sharpens, and maintains hand tools.
4. Makes adjustments on power equipment.
5. Cleans and maintains (oils) power equipment.
6. Remodels and repairs existing structures.

CARPENTRY TASK ANALYSIS, Sanford Research Project, 1972.

CARPENTRY HAND TOOLS

1. Reads and measures with a folding wood rule, layout tape, and a combination square.
2. Copies and transfers angles, using a sliding T-bevel.
3. Reads linear scales and checks squareness using the framing square.
4. Checks vertical wall for plumbness and flat surface for levelness.
5. Cuts stock with the crosscut saw.
6. Cuts stock with the keyhole saw.
7. Cuts trim with the coping saw.
8. Operates the miter box saw to make square and angular cuts.
9. Cuts metal with the hacksaw.
10. Adjusts and uses the block plane and jack plane to cut stock.
11. Chops and cuts stock with the "carpenter's" hatchet.
12. Cares for and uses wood chisels.
13. Bores holes with brace using auger and expansion bits.
14. Selects and uses standard screwdriver and spiral ratchet (yankee) screw driver.
15. Selects and uses hammers in construction.

PORTABLE POWER TOOLS

1. Crosscuts and rips with the electric circular saw.
2. Cuts curves and angles with the electric jig saw.
3. Trims and cuts joints with a portable router.
4. Planes with the electric plane.
5. Drills holes with the electric hand drill.

6. Sands with the portable belt and vibrating sanders.

7. Cuts angles with the electric miter box.

WOODWORKING MACHINE TOOLS

1. Crosscuts and cuts dados with the radial-arm saw.

2. Planes stock to thickness on planer.

3. Rips and crosscuts with the table saw.

4. Cuts curves and angles on the band saw.

5. Planes stock on the edge using the jointer.

6. Smoothes edges and cuts patterns on the wood shaper.

7. Drills, countersinks, counterbores, and drum sands on drill press.

LUMBER

1. Knows construction woods and their physical properties.

2. Knows varieties and grades of plywoods.

3. Calculates total board feet for a given amount of lumber.

4. Calculates total square feet measurements for given amount of plywood.

5. Knows the difference between normal and actual lumber sizes.

6. Knows different grades of lumber.

FASTENERS AND ADHESIVES

1. Identifies fasteners (nails and screws) for wood construction.

2. Identifies and knows the use of fasteners for concrete and masonry.

3. Knows and applies glue and mastics.

PLANS, SPECIFICATIONS, AND CODES FOR HOUSES

1. Identifies and interprets architectural lines, symbols, and abbreviations which are frequently used in prints.

2. Interprets and understands residential building construction plans and schedules.

FOOTINGS AND FOUNDATIONS FOR A HOUSE

1. Sets up transit to level corners.

2. Sets up batter boards and squares the house.

3. Knows the types of foundation supports in constructing a house.

HOUSEHOLD CABINETS

1. Understands the basic construction of the bathroom cabinet.

2. Understands the basic construction of the kitchen overhead cabinet.

3. Understands the basic construction of the kitchen base cabinet.

4. Installs the laminated plastic top on the kitchen base cabinet.

FLOOR FRAMING FOR A HOUSE

1. Constructs a floor beam with ledger strips.

2. Cuts and installs floor joists.

3. Cuts and installs bridging.

4. Cuts and installs sub-floor.

5. Cuts, marks, and installs shoe.

WALL FRAMING FOR A HOUSE

1. Selects and cuts full length and cripple wall studs.

2. Constructs wall corners.

3. Constructs T's for intersecting walls.

4. Constructs window and outside door headers.

5. Cuts, marks, and installs top plates.
6. Cuts and installs double plates.
7. Cuts and installs bracing in the house.
8. Cuts and installs ceiling joists.
9. Cuts and installs purlins.
10. Constructs headers for inside doors and case openings.

ROOF FRAMING FOR A HOUSE

1. Lays out and cuts common rafters.
2. Marks off and installs ridge board.
3. Cuts and installs roof bracing.
4. Cuts, builds, and installs roof truss.
5. Cuts and installs framing in gable.
6. Builds and installs louver.
7. Cuts and installs roof sheathing.
8. Cuts and installs felt paper.
9. Marks off roof and installs shingles.

EXTERIOR WALL FINISH

1. Cuts and installs insulation board.
2. Cuts and installs wall sheathing.
3. Cuts and installs siding.
4. Cuts and installs fascia board.
5. Cuts and installs plywood boxing in eaves.
6. Cuts and installs plywood for sealing the rake.
7. Cuts and installs bed molding between eave and sidewall.
8. Cuts and installs corner boards or metal corners.
9. Installs window units as specified on drawing.

10. Installs outside entrance door frame.

11. Hangs door, using butt hinges.

12. Installs entrance lockset.

INTERIOR WALLS, CEILING, AND FLOOR FINISH

1. Cuts, installs, and staples insulation batts.

2. Cuts and installs sheet rock.

3. Cuts and installs wood panels.

4. Cuts and installs ceiling tile.

5. Cuts and installs hardwood flooring.

6. Cuts and installs under layment for receiving tile or carpet.

DOOR AND INTERIOR TRIM

1. Cuts and installs crown molding.

2. Cuts and installs door jambs.

3. Cuts and installs door trim.

4. Hangs interior doors and installs locks.

5. Installs sliding or bi-fold doors.

6. Cuts and installs window trim.

7. Cuts and installs baseboard and shoe molding.

8. Cuts and installs metal threshold.

CARPENTRY TASK ANALYSIS, Nebraska Department of Education.

SAFETY

1. Exercise care in using and storing inflammables and combustibles.
2. Correct unsafe conditions of tools and machines.
3. Provide adequate ventilation when using solvents.
4. Exercise care in all operations about job or construction site.
5. Correct unsafe conditions of ladders and scaffolding.
6. Recognize safe areas of job or construction site--avoid unsafe areas.
7. Report unsafe conditions to immediate supervisor.
8. Exercise care in handling or using tools.
9. Exercise care in handling or using machines.

BLUEPRINT READING AND PLANNING

1. Read, understand, and interpret blueprints (building plans).
2. Interpret blueprint symbols.

LABOR AND MATERIAL ESTIMATING

1. Estimate materials and supplies.

BUILDING SITE LAYOUT

1. Determine grade level.
2. Layout excavation lines.
3. Erect batten boards.
4. Layout building lines according to a plot plan.

FOOTING AND FOUNDATION

1. Set forms for footings.
2. Install reinforcing steel in concrete.
3. Set wall forms for concrete foundation.

4. Level and brace finished concrete forms.

5. Install expansion joints between concrete floors and walls and between slabs.

6. Construct concrete step and stair forms.

7. Remove concrete forms.

FRAMING - FLOORS

1. Install sills.

2. Install floor joists.

3. Lay subfloor.

4. Install bridging.

5. Layout and construct wooden steps and stairways.

FRAMING - WALLS

1. Layout plates and studs for conventional wall sections.

2. Frame doors, windows, and build corners.

3. Install corner bracing in outside walls.

4. Raise, plumb, tie and brace wall sections.

5. Measure, layout, cut and install plywood and insulation board outside wall sheathing.

6. Install firestops and fixture backing.

7. Install posts and beams.

8. Identify various types of scaffolds.

9. Construct temporary scaffolds and scaffold brackets.

10. Assemble prefabricated scaffolding.

FRAMING - CEILING AND ROOF

1. Install ceiling joists.

2. Layout double plate and ridge boards for rafters.

3. Layout and cut all types of rafters.

4. Install termite flashing.

5. Raise and align rafters.

6. Layout and frame flat roofs.

7. Identify types of roof trusses.

8. Construct conventional roof trusses to specifications.

9. Measure, layout, cut and install roof sheathing.

FINISH WORK

1. Install windows and doors.

2. Install prehung doors.

3. Fit and install custom made door jambs and doors.

4. Assemble and install cabinets and built-in fixtures.

5. Fit and hang doors.

6. Measure, layout, cut and install wood paneling for walls.

7. Measure, layout, cut and install exterior trim.

8. Measure, layout, cut and install exterior siding, (aluminum, asbestos, planking, etc.)

9. Measure, layout, cut and install cornice work and trim.

10. Measure, layout, cut and install weather stripping.

11. Install hardware, locks, etc.

12. Install baseboard and other trim and molding.

13. Install door and window trim.

14. Set, level, and plumb cabinet work.

TOOLS AND EQUIPMENT

1. Use and maintain a miter box.

2. Use and maintain a chisel.

3. Use and maintain a plumb bob.

4. Use and maintain a level.

5. Use and maintain a block plane.

6. Use and maintain a jack plane.

7. Use and maintain layout and measuring tools such as the framing square, steel tape, etc.

8. Use and maintain a claw hammer.

9. Use and maintain screw drivers.

10. Use and maintain a hand saw.

11. Use and maintain a compressed air nailer.

12. Use and maintain an electric plane.

13. Use and maintain a router for cutting gains in door jambs.

14. Use and maintain a motorized miter box.

COMPLETION TASKS

1. Measure, layout, cut and install interior dry wall.

2. Measure, layout, cut and install acoustical panel and suspended ceilings.

3. Measure, layout, cut and install building paper or mastic on subfloor.

4. Measure, layout, cut and install ceiling insulation.

GENERAL COMPETENCIES

1. Communicate with terminology common to carpentry.

2. Associate common carpentry terms such as rafter, joist, stud, plate, mortice, etc. to on-site construction practice.

3. Use common hardware associated with carpentry, such as nails, screws, glue, etc.

4. Clean up building site. (Determine difference between scrap and useful lumber.)

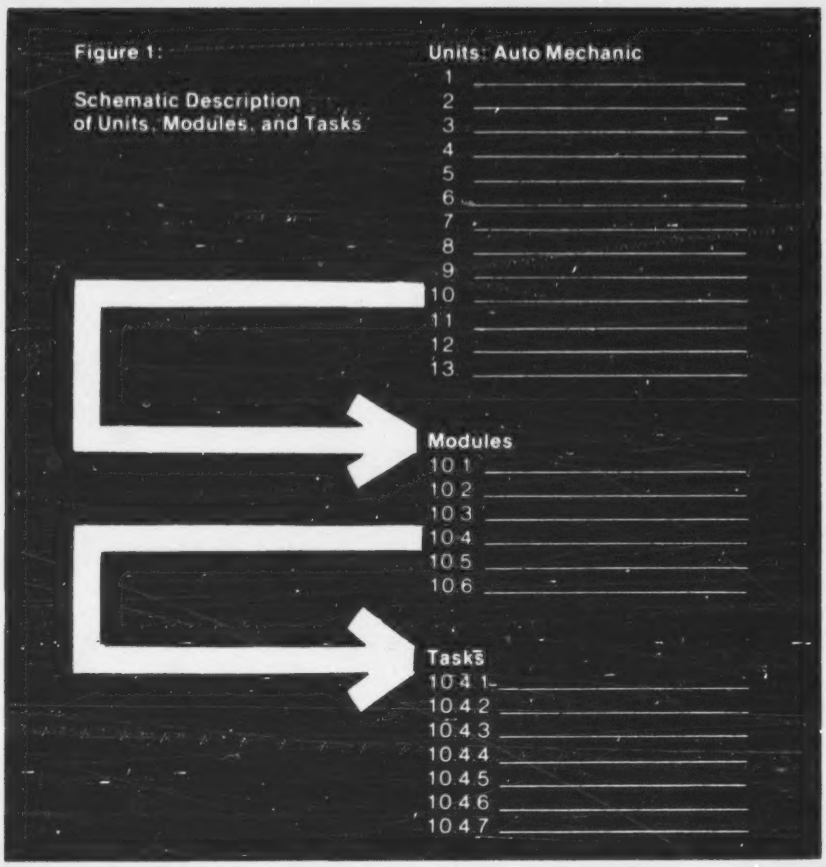
5. Stack lumber.

6. Install and assemble prefabricated building components.

7. Tape and finish dry wall.

A Modular Approach to Vocational Curriculum

by Victor L. Dupuis
and Paul E. Bell



At the Admiral Perry Vocational-Technical School in Ebensburg, Pennsylvania, students in every career area make their way through a modular curriculum which permits them to work independently and progress at their own pace. Computer terminals located in each classroom direct the students to units and modules of instruction and record their progress. Data stored in the computer provide students with meaningful references when they approach prospective employers on completion of their courses.

The Admiral Perry school reflects a new direction in vocational curriculum development in the Commonwealth of Pennsylvania. Until now, modular organization has been used primarily for comprehensive high school curriculum, but the strong trend toward individualized instruction has prompted vocational-technical schools in the state to begin program planning along modular lines.

The curriculum of most vocational-technical schools still tends to be organized around cluster areas of career choices and community needs. The usual practice of determining these curriculum clusters has been to make an assessment of needs in the geographical area served by the school. This type of survey helps to identify jobs and competencies for which business and industry see a demand. It also helps to dictate the number and variety of curriculums a vocational school will offer.

The application of the modular approach to community survey data is a comparatively recent departure in vocational curriculum development. It is a systematic way of identifying and describing self-contained sections of content and skills which in total comprise an entire career area. The process requires a complete description of the career area in terms of competencies needed instead of time spent by the student in the learning situation. It provides a blueprint for individualizing instruction in the vocational-technical school.

Determined by the Marketplace

Traditionally vocational schools have established advisory boards or committees to assist in the selection and monitoring

of curriculum offerings. Usually, however, the work of the advisory board ends at this point and a teaching staff and curriculum coordinators take over to share in the nitty-gritty of curriculum development.

Since the advisory staffs consist of experienced people in a trade or occupation—skilled workers, technicians, and professionals—their role in vocational curriculum development is critical. They should be actively engaged in the enumeration and specific development of competencies necessary for at least initial entry into the marketplace.

It may be one thing, however, to be a successful mason and quite another thing for that mason to be able to describe the precise steps necessary for training fledgling youth who want to enter the occupation. The same holds true for the cosmetologist, practical nurse, dental technician, auto mechanic, or any other trained worker. The *Dictionary of Occupational Titles* may describe the finished product and resultant duties, but the steps taken to acquire expertise in training can only be determined by the cooperation of those judged successful in the field of work and those who must teach the vocational student.

The Consulting Team

Some three years ago, in preparation for opening the Admiral Perry Vocational-Technical School, a modular approach was taken to develop curriculum for the newly created vocational-technical school district to be served by the new school. Following identification of each curriculum cluster, an advisory board was established for each career area. Each board was later to become a sort of monitoring group for the pre-determined curriculum offering.

It was agreed that currently licensed vocational-technical teachers could serve effectively in identifying the content areas for each of the career fields. Thus expert vo-tech teachers in Pennsylvania were chosen to attend a workshop which had as its major goal the identification of required competencies for all career areas to be offered in the new school.

The auto mechanic teacher, for example, had to define just what an auto mechanic is. He had to decide not only what the auto mechanic must know and do as an employee specialized in some phase of auto repair but also what he must know and do if he wanted to manage his own shop.

A Career Field Described

Before either broad question could be answered, the curriculum content of the whole career field had to be described in terms of "units," "modules," and "tasks." In the auto mechanics field, modules and tasks were established under these 13 broad units of content:

1. Welding
2. Hand tools
3. Lubrication and conditioning
4. Brake Systems
5. Cooling systems
6. Suspension systems
7. Drive train
8. Transmission
9. Engines
10. Fuel systems
11. Exhaust systems
12. Electrical systems
13. Air conditioning

The skills and competencies required if the student wanted to operate his own business (safety, business practice, personnel management, etc.) were described in units which could serve as common learning experiences for students entering a variety of career fields, such as a unit on employee negotiations.

After each broad content unit was identified and described, the vo-tech teachers serving as consultants defined content modules relevant to each curriculum unit. The modules established for fuel systems (Unit 10) were:

10.0 Fuel Systems
- 10.1 Gas tanks, fuel lines, and gas filters
- 10.2 Air cleaners and anti-pollution devices
- 10.3 Chokes
- 10.4 Pumps
- 10.5 Carburetors, intake manifolds, and heat risers
- 10.6 Throttle linkages

(The list of modules for this curricular unit is not presented here as all-inclusive but merely as a descriptive sample of modules.)

Finally, the consultant teachers described specific tasks for each module of each unit. For example:

10.0 Fuel Systems
- 10.4 Fuel pumps
  - 10.4.1 Remove and replace electrical fuel pumps
  - 10.4.2 Repair electrical fuel pumps
  - 10.4.3 Remove and replace mechanical fuel pumps
  - 10.4.4 Repair mechanical fuel pumps
  - 10.4.5 Remove and replace combination fuel pumps
  - 10.4.6 Repair combination fuel pumps
  - 10.4.7 Diagnose fuel pump malfunctions

A schematic description of the units, modules, and tasks listed above is presented in Figure 1. The vo-tech teachers supplied this type of descriptive specification for each career area.

Once they had completed this task, the advisory board for each career area was assembled in a workshop to cross check the content identified. In other words, the experienced craftsmen, technicians, and professionals were asked to engage in an activity similar to that of the teachers. They served as a type of validity check for the curriculum content. Here in the workshops they shared their day-to-day, on-the-job experience and knowledge of what the teachers had identified as competency areas for future vocational students.

From this point on, the task of the advisory boards was to assist in the continuous monitoring and selection of content for the curriculum clusters.

Regular Teachers Take Over

The next step was to employ regular teachers to review all of the work done by the consultant teachers and advisory boards and establish specific objectives for each cluster area. This was accomplished during a summer workshop before the school opened.

First the teachers translated the modules and tasks into behavioral terms and assessed the relevancy and teachability of each. They then prepared job specification plans that indicated the specific activities for each task, the materials to be used, the approximate time required for successful completion, and the criteria to be employed in determining successful completion of each task and module.

The summer inservice program provided each teacher with the curriculum development skills he needed to state his objectives clearly and develop the final draft of the curriculum cluster to be used in his career area. The curriculum for automotive mechanical repair consisted of 14 units, 52 modules, and 281 tasks. The total recommended time for successful completion of this curriculum area was 71 weeks. Tasks for each module were stated as performance objectives, and sequenced so that students could tackle them on an independent basis and proceed through each module at their own pace.

It was anticipated that some students could complete the entire curriculum area in 71 weeks while others would require less time. It was further expected that the degree of success with which each student completed the curriculum would provide him with a technical, operational, or skill rating for the career area he had chosen.

Delivery to the Student

As the student proceeded through each task, module, and unit, he was to be closely monitored by his instructor and his progress recorded and stored in a computer facility. Each teaching station in the new school was equipped with a computer terminal which could record the student's progress and direct him to modules and units as required to complete a total career area.

The tasks for each module, as indicated on the job specification sheet, would call for varying degrees of theoretical study, practice, demonstration, and measured demonstrated competency. If, for example, the expected behavior was to demonstrate the ability to repair electrical fuel pumps, the student would proceed as follows.

To acquire the prerequisite knowledge associated with electrical fuel pumps, he could read an assigned text or observe films or a demonstration by the teacher.

He could practice the repair of pumps until he felt he had mastered the task.

When he and his teacher determined that he had acquired the necessary skills for repairing electrical fuel pumps, he would be required to demonstrate successful performance of that task during a specified number of testing trials.

His progress through each task and module would be programmed to follow this pattern.

Beyond providing students with demonstrated competencies in their chosen occupations, curriculum modules offer a number of other advantages. Modules, or portions thereof, are convenient components for revision and updating to meet the changing demands of the marketplace.

Modular organization also permits more efficient use of staff. For example, in the curriculum developed for the Admiral Perry school, the basic drafting modules used in carpentry, machines, plumbing, metal working, electronics, electricity, and masonry were cooperatively developed and can be taught by any instructor from those fields on a rotation basis or in any other sequence convenient to the instructors.

Moreover, the modular approach is easily transferable to general education. Supposing a large number of vocational courses demanded a prerequisite of metric measurement. A module could be created by the vo-tech faculty and if the feeder schools wished to incorporate it into their mathematics programs, it could be transferred without disrupting the vocational curriculums.

Most important, modules ensure the careful handling of individual differences. Students progress at their own rate and desired degree of success or rating. Experience or learning acquired beforehand allows students to test successfully through tasks and modules and move through the curriculum more quickly. And computer storage of student progress provides prospective employers with data that are more meaningful than the usual letter grades that accompany a transcript.

As vocational education continues to move in the direction of total life education, with what that implies for continual updating in one's chosen career field, up-to-date modules can enhance a student's career development throughout his lifetime. □

About the authors

Drs. Dupuis and Bell, both of whom are associate professors of education at Pennsylvania State University, conducted the workshops for the curriculum development project they describe in this article. Dr. Dupuis is also chairman of Curriculum and Supervision in the University's Division of Academic Curriculum and Instruction.

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MODULAR COURSE OUTLINE FOR CARPENTRY, Gilbert Boschert, Eastern Vocational-Technical Center, Essex, Maryland, 1974.

1. CONSTRUCTION BLUEPRINT READING AND ESTIMATING
   - 1.1 Sketching, Scaling and Symbols
     - 1.1.1 Draw a freehand three-view sketch.
     - 1.1.2 Make a scale drawing.
     - 1.1.3 Using the symbol chart provided, insert bathroom plumbing and electricity symbols in the proper places on the scale drawing.
   - 1.2 Interpreting Blueprints
     - 1.2.1 Read and study blueprints and specifications.
     - 1.2.2 Interpret symbols and abbreviations on blueprint.
     - 1.2.3 Compare blueprint information to specifications information.
   - 1.3 Building Codes and Specifications
     - 1.3.1 Study area building code.
     - 1.3.2 Compare blueprint and specifications to area building code requirements.
     - 1.3.3 Write a valid set of specifications.
   - 1.4 Estimating Principles and Forms
     - 1.4.1 Analyze the technique of estimating.
     - 1.4.2 Study the quantity survey form.
     - 1.4.3 Study expense and summary sheets.
   - 1.5 Material Take-Off and Job Scheduling
     - 1.5.1 Complete a material take-off.
     - 1.5.2 Complete a labor costs sheet.
     - 1.5.3 Complete an expense and overhead cost sheet.
     - 1.5.4 Complete an estimate summary sheet.

2. SITE PREPARATION AND EXCAVATION
   - 2.1 Preliminary Site Inspection
     - 2.1.1 Inspect an unimproved lot for future building site.
     - 2.1.2 Ascertain the ease of vehicle entrance onto the property.
     - 2.1.3 Ascertain the availability of utilities - sewer, water, gas and electricity.
     - 2.1.4 List obstacles to construction found on the lot - trees, large rock formations, steep grades, etc.
   - 2.2 Principles of Building Lot Surveying
     - 2.2.1 Set up a transit level.
     - 2.2.2 Establish the lot lines.
     - 2.2.3 Establish front, rear and side set back lines.
     - 2.2.4 Lay out approximate building lines.

2.3 Excavation
- 2.3.1 Erect batter boards.
- 2.3.2 Lay out exact building lines using both the transit method and the 6-8-10 method.
- 2.3.3 Establish the depth of cut for each corner of the proposed excavation.
- 2.3.4 Establish the proper location for the deposit of excavated material.

3. FOOTINGS AND FOUNDATION WALLS

3.1 Footings
- 3.1.1 Check position of existing batter boards.
- 3.1.2 Locate footing corners in relation to exact building lines.
- 3.1.3 Install concrete elevation stakes in excavated footing.

3.2 Concrete Forms
- 3.2.1 Construct a double wall 4' x 8' concrete form.
- 3.2.2 Install wales, braces, spreaders and wires.
- 3.2.3 Align form.

3.3 Block wall layout
- 3.3.1 Install corner nails in footing for blocklayer.
- 3.3.2 Locate door and window openings for blocklayer.
- 3.3.3 Shoot elevation grades on sixth course of block for blocklayer.

4. FLOOR FRAMING

4.1 Girder and Lolly Columns
- 4.1.1 Give safety talk and demonstration on proper use of portable electric saw.
- 4.1.2 Cut and assemble built-up girder.
- 4.1.3 Install girder with lolly columns.

4.2 Termite Shield and Sill
- 4.2.1 Install termite shield on top of foundation walls.
- 4.2.2 Cut, drill and install foundation sill.
- 4.2.3 Lay out joist 16" center marks on sill.

4.3 Floor Joists
- 4.3.1 Install regular joists and skirt.
- 4.3.2 Lay out, cut and install stairwell header joists, trimmers and tail joists.
- 4.3.3 Lay out and install double joists at secondary partition locations and at end joists locations.

4.4 Bridging
- 4.4.1 Lay out, cut and install cross bridging and solid bridging where required.

4.5 Subfloor
- 4.5.1 Install plywood subfloor.
- 4.5.2 Use transit to check platform for level.

5. WALL FRAMING
   - 5.1 Sole and Top Plate
     - 5.1.1 Lay out 16" on center stud positions and cut sole and top plate.
     - 5.1.2 Lay out window and door rough openings on sole and top plate.
   - 5.2 Studs and Corner Posts
     - 5.2.1 Cut studs to proper length and nail in place.
     - 5.2.2 Cut, assemble and nail in place corner posts.
   - 5.3 Window and Door Openings
     - 5.3.1 Cut and install window and door headers, sills, jack studs and cripple studs.
     - 5.3.2 Cut and install double top plate.
   - 5.4 Erect, Plumb and Brace Walls
     - 5.4.1 Erect and secure outside walls and center partitions.
     - 5.4.2 Plumb, brace and align walls and partitions.
   - 5.5 Wall Sheathing
     - 5.5.1 Cut and install corner bracing plywood where required.
     - 5.5.2 Cut and install remaining wall sheathing.

6. ROOF FRAMING
   - 6.1 Ceiling Joists
     - 6.1.1 Lay out 16" on center ceiling joists on bearing walls and center partitions.
     - 6.1.2 Install ceiling joists.
   - 6.2 Rafters - Common, Hip and Valley
     - 6.2.1 Study the framing square and the uses of its scales and tables.
     - 6.2.2 Lay out and cut a common rafter.
     - 6.2.3 Lay out and cut a hip rafter.
     - 6.2.4 Lay out and cut a valley rafter.
   - 6.3 Ridge Board
     - 6.3.1 Lay out and cut ridge board.
     - 6.3.2 Install and brace common rafters and ridge board.
   - 6.4 Trusses
     - 6.4.1 Lay out, cut and assemble a typical roof truss.
   - 6.5 Gable End
     - 6.5.1 Lay out, cut and install gable end studding.
     - 6.5.2 Lay out, cut and install gable end sheathing.
     - 6.5.3 Lay out, cut and install collar beams.
   - 6.6 Roof Sheathing
     - 6.6.1 Fit, cut and install plywood roof sheathing.

7. SCAFFOLDING AND LADDERS

7.1 Step Ladder and Extension Ladder

7.1.1 Study the proper use of the stepladder and the possible dangers involved in misuse of stepladder.

7.1.2 Demonstrate the proper means of raising and positioning an extension ladder.

7.2 Prefabricated Metal Scaffold

7.2.1 Demonstrate the proper assembly of metal prefabricated scaffold.

7.3 Pump Jack Scaffold

7.3.1 Demonstrate the proper assembly of pump jack scaffold.

7.3.2 Demonstrate the raising and lowering techniques of the pump jack scaffold.

7.4 Post and Ledger Scaffold

7.4.1 Cut and assemble a 2 x 4 post and ledger scaffold.

8. ROOFING

8.1 Felt Paper

8.1.1 Measure, cut and install roofing felt.

8.2 Asphalt 3 - Tab Roofing

8.2.1 Lay out and install the starter course of roof shingles.

8.2.2 Lay out and install the starter set of roof shingles.

8.2.3 Cover remaining area of roof with shingles.

8.3 Roll Roofing

8.3.1 Measure, cut and fit roll roofing.

8.4 Flashing

8.4.1 Cut and install valley flashing.

8.4.2 Cut and install chimney flashing and counter flashing.

9. EXTERIOR TRIM

9.1 Cornice

9.1.1 Measure, cut and install fascia.

9.1.2 Measure, cut and install plancier.

9.1.3 Measure, cut and install frieze.

9.1.4 Measure, cut and install verge board.

9.1.5 Measure, cut and install soffit.

9.2 Gutter and Spouts

9.2.1 Measure, cut and install gutter.

9.2.2 Measure, cut and install downspout.

9.3 Window and Door Frames

9.3.1 Cut sill flush with outside edge of casing and side jambs flush with top of head and bottom of sill.

9.3.2 Install felt around rough opening.

9.3.3 Install frame in rough opening in plumb and level position.

9.4 Louvers

9.4.1 Install louvers in gable ends.

10. SIDING

10.1 Aluminum and Vinyl Siding

10.1.1 Install corner posts.

10.1.2 Install starter strip and window and door trim.

10.1.3 Cut and install siding with insulated backing.

10.2 Asbestos Shingles

10.2.1 Install felt paper.

10.2.2 Install corner beads.

10.2.3 Install cant strip.

10.2.4 Cut and install shingles.

10.2.5 Caulk windows and doors.

10.3 Redwood Bevel Siding

10.3.1 Install felt paper.

10.3.2 Install corner boards.

10.3.3 Install cant strip.

10.3.4 Install bevel siding.

10.4 Board and Batten

10.4.1 Install felt paper.

10.4.2 Install vertical panel.

10.4.3 Install batten.

10.4.4 Install corner lap boards.

10.5 Cedar Shakes

10.5.1 Install felt paper.

10.5.2 Install double first course.

10.5.3 Install cedar shakes.

11. INSULATION AND INTERIOR WALL FINISH

11.1 Insulation - Blanket, Batt and Loose Fill

11.1.1 Cut blanket or batt to length and staple into place.

11.1.2 Spread loose fill insulation over ceiling material.

11.2 Gypsum Wallboard

11.2.1 Measure, cut and install gypsum wallboard.

11.2.2 Tape joints and corners with three coats of joint compound.

11.2.3 Cover nail heads with three coats of joint compound.

11.3 Wood Paneling

11.3.1 Measure, cut and install 4' x 8' panels.

11.3.1 Install base and cove molding.

11.4 Ceiling Tile

11.4.1 Install 1 x 2 furring strips.

11.4.2 Install 12" x 12" acoustical ceiling tile.

11.4.3 Install cove molding.

11.4.4 Install suspended ceiling grid system.

11.4.5 Install ceiling panels.

12. STAIR BUILDING

12.1 Rough Stringers

12.1.1 Establish tread and riser measurement.

12.1.2 Lay out, cut and install the rough stringers.

12.2 Treads and Risers

12.2.1 Cut and install treads and risers.

12.3 Newel, Handrail and Balusters

12.3.1 Cut and install newel.

12.3.2 Cut and install handrail.

12.3.3 Cut and install balusters.

12.4 Skirting Board and Open Stringer

12.4.1 Lay out, cut and install skirting board.

12.4.2 Lay out, cut and install open stringer.

12.5 Brackets, End Mosing and Scotia

12.5.1 Cut and install brackets.

12.5.2 Cut and install return mosing.

12.5.3 Cut and install scotia.

13. INTERIOR TRIM

13.1 Tongue and Groove Flooring

13.1.1 Install red rosin paper over subfloor.

13.1.2 Cut and install tongue and groove floor.

13.2 Resilient Tile Floor and Underlayment

13.2.1 Cut and install underlayment.

13.2.2 Lay out and install resilient tile floor.

13.3 Window and Door Trim

13.3.1 Measure, cut and install window stool and apron.

13.3.2 Measure, cut and install window casing.

13.3.3 Measure, cut and install sash stop.

13.3.4 Measure, cut and assemble door jamb.

13.3.5 Measure, cut and install door casing.

13.4 Door Hanging

13.4.1 Give safety talk and demonstration on proper use of portable electric plane and electric router.

13.4.2 Bevel both edges of door and fit to jamb opening.

13.4.3 Scribe top and bottom of door to head and floor and cut to fit.

13.4.4 Route out and install hinges on jamb and door.

13.4.5 Install door in jamb.

13.4.6 Mortise and install lock set and strike plate.

13.4.7 Measure, cut and install door stop.

13.4.8 Install pre-hung door units.

13.5 Baseboard, Molding and Closet Shelves

13.5.1 Cut and install ranch base.

13.5.2 Cut and install shoe molding.

13.5.3 Cut and install closet shelf brackets.

13.5.4 Cut and install closet shelving and closet pole.

13.6 Finish Hardware

13.6.1 Install sash locks.

13.6.2 Install door bumpers.

13.6.3 Install exterior door weatherstrip.

14. CABINET WORK

14.1 Kitchen Cabinets

14.1.1 Fit and install factory-built kitchen cabinets.

14.1.2 Fit and install factory-built counter tops.

14.1.3 Install cabinet hardware and molding.

14.2 Bathroom Vanities

14.2.1 Fit and install factory-built vanity cabinet.

14.2.2 Fit and install factory-built vanity tops.

14.2.3 Install vanity hardware and molding.

MODULAR COURSE OUTLINE WORK SHEET

TASK	
No.	
MODULE	
No.	
UNIT	
No.	

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EMPLOYABILITY PROFILE

OSWEGO COUNTY BOARD OF COOPERATIVE EDUCATIONAL SERVICES

MEXICO, NEW YORK 13114

PHONE: 315-963-7251

Name _____ Home School _____ Grade _____

Course CARPENTRY Date _____ Quarter 1st__ 2nd__ 3rd__ Final__

The following is a list of operations and skills that the above student has been exposed to, and instructor's appraisal of his/her entry level employability in these areas. These operations have been accompanied by a significant amount of classroom work in related theory.

HAND TOOLS
- Measuring & Layout Tools
- Saws
- Planes & Chisels
- Boring Tools
- Fastening Tools
- Holding Tools
- Prying Tools
- Sharpening Tools
- Care & Maintenance

PORTABLE POWER TOOLS
- Circular Saws
- Saber Saws
- Electric Drills
- Power Planes
- Routers
- Sanders
- Staplers & Nailers
- Care & Maintenance

STATIONARY WOODWORKING MACHINES
- Radial Arm Saw
- Table Saw
- Jointer & Planer
- Band Saw
- Shaper
- Disk & Belt Sander
- Care & Maintenance

SAW FILING EQUIPMENT
- Automatic Saw Filer
- Circular Saw Grinder
- Retoother
- Hand Setter
- Care & Maintenance

LEVELING INSTRUMENTS
- Setting Up Instrument
- Sighting & Leveling
- Care & Maintenance

BUILDING MATERIALS
- Grades & Kinds of Woods
- Plywood
- Wood Identification
- Lumber Sizes & Estimating
- Non-Wood Materials
- Metal Fasteners
- Adhesives

PLANS, SPECIFICATIONS, CODES
- Blueprint Reading
- Sketching, Scaleing, & Symbols
- Bldg. Specificatoons & Codes
- Estimating

FOOTINGS & FOUNDATIONS
- Layout & Batter Boards
- Excavation
- Wall Forms & Footing Forms
- Estimating Concrete & Block

FLOOR FRAMING
- Types of Framing
- Girders, Beams & Headers
- Installs, Joists, & Bridging
- Installs, Sills
- Layout of Joists & Openings

WALL & CEILING FRAMING
- Understands Parts of Wall Frame
- Layout of Plate & Openings
- Constructs Wall Sections
- Application of Wall Sheating
- Installs Ceiling Joists
- Estimating of Materials

ROOF FRAMING
- Roof Types & Parts of Roof Frame
- Layout Terms & Principles
- Layout Rafters
- Use of Rafter Table
- Roof Truss Construction
- Roof Sheating
- Estimating

ROOFING MATERIALS
- Types of Materials & Terms
- Application of Roofing
- Gutters & Dripedge
- Estimating Materials

WINDOWS & EXTERIOR DOORS
- Types of Windows & Terms
- Installing Windows
- Types of Exterior Doors & Terms
- Installing Doors
- Installing Window & Door Hardware

EXTERIOR WALL FINISH
- Cornice Construction
- Exterior Siding
- Installation & Maintenance
- Estimating

THERMAL & SOUND INSULATION
- Types of Insulation
- Installing Methods
- Estimating

INTERIOR WALL & CEILING FINISH
- Lath & Plaster
- Gypson Wallboard
- Hardboard Panels
- Suspended Ceilings
- Estimating Materials

FINISH FLOORING
- Types of Wood Flooring & Installation
- Installing Resilient Floor Tile
- Installing Carpeting
- Estimating

STAIR CONSTRUCTION
- Types of Stairs & Terms
- Stringer Layout

DOORS & INTERIOR TRIM
- Installing Door Frames
- Hanging Doors
- Install Casing, Base, & Shoe
- Installing Kitchen Cabinets
- Install Window Trim

PREFABRICATION

CARPENTRY AS A CAREER

WORK HABITS	IGNORES DIRECTIONS	FOLLOWS SOME DIRECTIONS, WORKS INEFFICIENTLY	FOLLOWS DIRECTIONS AND WORKS SATISFACTORILY	STEADY CONSCIENTIOUS WORKER	VERY ACCURATE RESOURCEFUL AND EFFICIENT
SAFETY HABITS	SLOPPY AND HAZARDOUS	FAIR, NEEDS IMPROVEMENT	GENERALLY WORKS SAFELY	MEETS REQUIRED SAFETY STANDARDS	NEAT, CONSCIENTIOUS AND CAREFUL
WORK AREA NEATNESS	VERY SLOPPY AND INCONSIDERATE	FORGETFUL AND UNCONSCIENTIOUS	ADEQUATE	THOROUGH	PRIDE IN OVERALL APPEARANCE OF FACILITIES
WORK AREA ATTENDANCE	OFTEN NOT IN WORK AREA	MAKES EXCUSES TO LEAVE WORK AREA	GENERALLY IN WORK AREA	SELDOM LEAVES WORK AREA	ALWAYS WHERE ASSIGNED
SELF ESTEEM	NO SELF-CONFIDENCE	INSECURE, SELF-CONSCIOUS, DEFENSIVE	BALANCED ATTITUDE	POSITIVE SELF EVALUATION	SELF-CONFIDENT AND SECURE
INTEGRITY	NOT TRUSTWORTHY	ERRATIC	SINCERE	RELIABLE AND DEPENDABLE	EXCEPTIONALLY TRUSTWORTHY
RESPONSIBILITY	UNRELIABLE	SOMETIMES RELIABLE	USUALLY RELIABLE	CONSCIENTIOUS	ASSUMES RESPONSIBILITY WELL

MOTIVATION	APATHETIC	SPORADICALLY MOTIVATED	GENERALLY MOTIVATED	INTERESTED IN EXCELLING	HIGHLY INVOLVED AND MOTIVATED
INITIATIVE	REQUIRES CONSTANT PRESSURE	NEEDS OCCASIONAL PRODDING	DOES ASSIGNED WORK	OCCASIONALLY SEEKS EXTRA WORK	SEEKS AND ACCOMPLISHES WORK TO BE DONE
EFFORT	"SHIFTER"	APPLIES MINIMAL EFFORT	SHOWS SATISFACTORY EFFORT	SHOWS GROWING DETERMINATION	DETERMINED, PERSEVERING, AND DILIGENT
PEER RELATIONS	UNCOOPERATIVE	SOMETIMES HARD TO WORK WITH	GENERALLY COOPERATIVE	WORKS VERY WELL WITH OTHERS	OUTGOING, WARM AND COOPERATIVE
LEADERSHIP	UNABLE TO LEAD	RESIGNS TO FOLLOW	SHOWS LEADERSHIP WHEN REQUESTED	VOLUNTARILY DISPLAYS LEADERSHIP	MAKES THINGS GO
REACTION TO AUTHORITY	HOSTILE	INDIFFERENT	ACCEPTING	GENERALLY COOPERATIVE	EXCEPTIONALLY COOPERATIVE

TOTAL DAYS ABSENT _____

TEACHER'S COMMENTS _____

TRAINING ACHIEVEMENT RECORD

Name _____ SSN _____ Date Trainee Entered Training _____

Title CARPENTER, CONSTRUCTION DOT Code 860.381 Certified by _____ Form No. 440.84 A

Achieved Individual Marketable Skill		PERFORMANCE				KNOWLEDGE			
		1	2	3	4	a	b	c	d
Safety									
1. Practice safety on the job	4d								
2. Know & use safe practice handling tools, woodworking machinery	4d								
General									
3. Know & understand carpenter terminology	4d								
4. Use & maintain common hand tools	3c								
5. Use & maintain measuring tools & equipment	3c								
6. Use & maintain power operated woodworking machines	3c								
7. Read, understand & interpret building sketches	2b								
Foundations, Walls, Floors & Stairs									
8. Lay out building lines & set stakes for grading	3c								
9. Build & place straight concrete forms	3c								
10. Line up & brace concrete walls & columns	3c								
11. Lay out footings, build or place forms & brace	3c								
12. Build irregular concrete forms	3c								
13. Lay out & cut stairs & treads; install railings	2b								
Framing (Foundations & Walls)									
14. Lay out & frame sills & girders	3c								
15. Frame & set floor joists	3c								
16. Lay out walls & partitions	3c								
17. Erect walls & partitions	3c								
18. Install sheathing & plaster grounds	3c								
Roofs									
19. Frame & set common rafters	3c								
20. Frame & set valley rafters	3c								
21. Frame & set hip rafters	3c								
22. Frame & set jack rafters	3c								
23. Apply sheathing, composition shingles & other types of roof coverings	3c								
Exterior Millwork									
24. Determine correct tools & materials, supplies for task	2b								
25. Operate skill saw, electric drill & sander	3c								
26. Set up & operate bench saw	3c								
Interior Wall Coverings									
27. Apply wood coverings	3c								
28. Apply composition, sheet rock or fiber board	3c								
29. Install baseboards	3c								
Floors									
30. Lay sub-flooring	3c								
31. Lay hardwood flooring	3c								
32. Build & place forms for concrete floors	3c								

JOB CORPS TRAINING ACHIEVEMENT RECORD

Interior Finish									
33. Cut & fit base and mouldings	3c								
34. Set door jambs; fit & hang doors	3c								
35. Fit & hand windows	3c								
36. Fit & fasten hardware	3c								
Remodeling									
37. Install aluminum & vinyl siding	3c								
38. Install combination sorm windows & doors	3c								
39. Lay new roofing materials	3c								
40. Install aluminum porch enclosures, awninge, patio covers	3c								
41. Install metal porch rails & stair rails	3c								
42. Install overhead garage coors & radio-controlled garage door opener	3c								
43. Install plastic, asbestos & vinyl floor coverings	3c								
Additional Related Training Elements									

EDUCATION, TECHNICAL KNOWLEDGE--JOB PHYSICAL PROFILE		PERFORMANCE				KNOWLEDGE			
		1	2	3	4	a	b	c	d
1. Use instructions furnished in written, oral, diagram or schedule form	4d								
2. Use arithmetic; apply practical algebra and geometry	4d								
3. Read and interpret technical materials	4d								
4. Prepare reports and summaries, conforming to good English usage	4d								
1. Able to lift 50 lbs.maximum;carry to 25 lbs;walk & stand continuously	4								
2. Able to climb & use back muscles & legs to stoop,kneel,crouch,crawl	4								
3. Able to use fingers, hands, arms to reach, handle, feel	4								
4. Able to see efficiently	4								
5. Work both indoors & outdoors where physical hazards exist	4								

ATTITUDES AND PROFESSIONAL ETHICS		ATTITUDES & ETHICS				
		I	II	III	IV	V
1. Demonstrate correct safety practices on the job	V					
2. Maintain appropriate personal hygiene and appearance	III					
3. Arrive on the job on time	IV					
4. Is on the job every day	IV					
5. Perform work of consistently good quality	IV					
6. Function cooperatively with fellow workers	III					
7. Treat others courteously	III					
8. Work with even temperament	III					
9. Accept constructive criticism	IV					
10. Follow instructions willingly	IV					
11. Deal well with supervision	IV					
12. Willingly work unusual schedules when required	III					
13. Handle proprietary information discreetly; respect confidences	III					
14. Respect worth of equipment, company and personal property	IV					

CURRICULUM RESOURCES

There has been a recent surge of interest throughout the country in curriculum and instructional development, and many guides, outlines, and instructional materials have been or are in the process of being developed. The resources in this section have been collected from many sources, including professional organizations, state education departments, federal agencies, schools, curriculum clearinghouses, research organizations, the commercial market, and universities and colleges. These resources represent the most recent developmental efforts. They provide the classroom teacher, moreover, with the capability of upgrading and restructuring his carpentry program.

While only quality resources have been included, the items which are exceptional and which appear to be valuable for all carpentry teachers are identified by the designation "RECOMMENDED" or "HIGHLY RECOMMENDED." It is suggested that individual instructors write for the items which appear most useful. Most of these materials require payment, and the exact cost can be obtained by writing directly to the source address given.

Apprentice Carpenter. (Lesson Plans, Study Guide and Workbook). 1971. 300 pages.

National Laboratory for the Advancement of Education
The Aerospace Education Foundation
1750 Pennsylvania Avenue, N. W.
Washington, D. C. 20006

Created and validated by the U.S. Air Force, this instructional package contains texts, lesson plans, workbooks, and programmed units. A complete plan of instruction spells out sequentially the learning objectives for each module in the system, including support materials and instructional methodology keyed to the objectives.

The course includes an introduction to carpentry and provides instruction on the carpenter's hand, portable power and shop tools, construction and maintenance of wood structures, and installation of building hardware. Units or modules include: introduction to carpentry; cabinet construction; building construction; and building finish work. May be purchased in hard copy ($72) or microfiche ($32).

Associated General Contractors of America
1957 E Street, N. W.
Washington, D. C. 20006

The Associated General Contractors of America is a national association which serves over 9,000 general contractors who are involved in heavy industrial and commercial construction. Within their Manpower and Training Division are five trades: carpentry; bricklaying; cement masonry; operating engineers; and ironwork. Residential building is not included.

The commercial carpenter works on large commercial and industrial buildings, whereas the residential carpenter works on homes. It is the commercial carpenter and his functions in the construction field that this association addresses. They have recently completed, in cooperation with the Oklahoma State Department of Vocational and Technical Education, a comprehensive curriculum manual on Commercial Carpentry.

Building Construction. n.d. 28 pages.

Vocational Industrial Service
West Virginia State Board of Education
Bureau of Vocational-Technical and Adult Education
Charleston, West Virginia 25305

Building Construction: An Integrated Secondary-Post Secondary Curriculum Guide. 1973. 138 pages.

Utah State Board of Education
1400 University Club Building
136 East South Temple Street
Salt Lake City, Utah 84111

The concept of open-entry education is stressed in this curriculum guide. Thus, a student can begin a course in high school and continue it in a post-secondary school without repeating that material which he or she has successfully mastered. There are nine units which include behavioral objectives, information subunits, and unit tests (both written and manipulative performance).

The guide is modular in nature in that each unit is independent of the others. Unit topics include: orientation; blueprint reading and planning; safety; tools and equipment; excavation layout - concrete and forms; lumber and building materials; floor and wall framing; roof framing; and finishing.

Building Construction: Occupational Cluster Guide. 1972. 271 pages.

The Oregon Board of Education
State of Oregon Department of Education
942 Lancaster Drive, N. E.
Salem, Oregon 97310

This guide provides teachers with instructional specifications for developing a curriculum that will give students background information about the building construction industry. Seven key occupations are represented: carpenter; trowel trades; iron worker; pipe trades; floor layer; painter; and roofer. A task analysis and instructional analysis are used to break down the learning experiences into seven units: communication; layout; construction materials; cutting and fitting; assembly; finishing; and safety. Each unit is developed into required knowledges, behavioral tasks, and suggested learning activities. An extensive listing of instructional materials, from films to pamphlets, is presented after each section. RECOMMENDED.

Building Construction, Volume I. 1973. Instructor's Guide, 309 pages. Individual Study Guide, 173 pages.

Instructional Materials Laboratory
Department of Practical Arts and Vocational-Technical Education
University of Missouri-Columbia
Columbia, Missouri 65201

These two manuals, one for use by the instructor, the other by the student, deal primarily with residential carpentry. Contained in the first part of the comprehensive instructor's guide is an occupational analysis on which the lesson plans were based. There are lesson plans throughout the guide using the following format: scope of the unit; behavioral objectives; references; list of teaching aids; introductory statement; lesson outline for steps of procedure; interaction items; suggested activities; and sample test items. Units included are: orientation, building preparation, and preliminaries; concrete and concrete construction; and floor and wall framing. There is a set of 86 transparencies and 11 handouts that are related to this volume which may be purchased.

The student's study guide covers the same units and lessons but does not follow the lesson plan format which the teacher uses. Nine tests consisting of mainly multiple-choice questions end each unit. RECOMMENDED.

Building Construction Volume II. 1973. Instructor's Guide, 377 pages. Individual Study Guide, 243 pages.

A continuation of Volume I using the same format for both instructor's and individual study guides. Units include: roof framing and finishing; plumbing; electrical wiring; insulating and heating; finishing exteriors; finishing interiors; and guidance. There is a set of 96 transparencies that can be purchased related to this volume. RECOMMENDED.

Building Industrial Occupations Syllabus. 1971. 117 pages.

The University of the State of New York
The State Education Department
Bureau of Secondary Curriculum Development
Albany, New York 12224

This curriculum guide is concerned with seven major construction trades: carpentry; masonry; plumbing; heating; electricity; air conditioning; and painting and decorating. The cluster concept is reflected, although the guide is organized into separate trade areas. The course is a two-year program with site work/carpentry allocated to 40 percent of the instructional time. A three-column format is used. The first column is a content outline, the second column contains performance objectives, and the final column suggests methods of presentation. There are 51 pages related to carpentry covering units in concrete forms, lumber, platform framing, wall framing, sheathing, scaffolding, ceiling joists, roof framing, exterior finish, and interior finish. A seven-page listing of resource material is also included.

Building Trades I Course Outline. 1974

Arizona Department of Education
Division of Career and Vocational Education
1535 West Jefferson Street
Phoenix, Arizona 85007

Within this state-wide department guide is a section on carpentry which contains a job description, training and qualifications, wages, advancement, employment outlook, and an instructional analysis. The instructional analysis contains the following units; reading blueprints, specifications, and estimating; framing a building; framing a roof; finishing the exterior; and finishing the interior. In turn, each of these units list tasks, information topics, and performance objectives.

Building Trades Guide: Carpentry. 1972. 24 pages.

Nebraska Department of Education
Division of Vocational Education
233 South Tenth Street
Lincoln, Nebraska 68508

One of nine brief curriculum guides in the building trades, this pamphlet contains 88 entry-level tasks or competencies identified by tradesmen and educators in Nebraska. The carpentry instructor is responsible for including these competencies in a course of study. No lesson plans, information sheets, behavioral objectives, etc., are provided. RECOMMENDED.

Carpentry: Supervised Study Guide for Related Instruction. 1973. 141 pages.

Vocational Instructional Service
Texas A & M University
College Station, Texas 77843

Carpentry and Cabinetmaking. Course of Study Outlines. 1965.

New Jersey Vocational-Technical Curriculum Lab
Rutgers University
4103 Kilmer Campus
New Brunswick, New Jersey 08903

This booklet contains course outlines for high school carpentry and cabinetmaking classes, in addition to one for a one-year adult education program. Math, science, and drawing that is related to carpentry is also included in the outlines. Outlines are in topical format and must be supplement with other instructional materials.

Carpentry Apprentice Related Training. 1974. (Four instructor's manuals).

Vocational Curriculum Management Center
Trade, Industrial, and Technical Education Section
Washington State Coordinating Council
for Occupational Education
216 Old Capitol Building
Olympia, Washington 98504

Consists of a series of four instructor's manuals which were developed by the Carpentry Apprentice Curriculum Revision Committee. These manuals are designed to meet the needs of organized study in the various technical aspects necessary for an apprentice to become a well-trained

journeyman. Each manual contains instructional units for one year of study. The units are modular and follow the format of stating objectives, references, visual aids, study assignments, important study points, work assignments, tests to be administered, and an introduction to the next lesson and materials needed for it.

The breakdown of units are as follows:

First year - Familiarization
Tools
Materials
Scaffolds and Staging
Basic Blueprint and Plot Layout
Foundations and Slabs

Second year- Rough Framing
Roof Framing
Stair Construction

Third year - Exterior Covering, Trim and Insulation
Interior Finish
Timber Structures
Concrete Construction

Fourth year- Review of first 3 years work

RECOMMENDED

Carpentry Apprenticeship Related Training and Manipulative Curriculum. 1974. 24 pages.

Oregon-Washington Carpenters
Employers Apprenticeship and Training Trust
Suite 115, Morquam Plaza
2525 Southwest 3rd Avenue
Portland, Oregon 97201

Contains courses and topical outlines of the classroom instruction for carpentry apprentices. A list of textbooks, films, and other references is given. Good source for comparing vocational training in high schools with apprenticeship programs.

Carpentry Course of Study. 1968. 398 pages.

Bureau of Vocational-Technical Education
Division of Trade and Industry
State Office Building
Frankfort, Kentucky 40601

Carpentry Employability Profile. n.d. 1 page.

Oswego County Board of Cooperative Educational Services
Oswego, New York 13126

This one-page profile contains a list of carpentry operations and skills that students are expected to, along with the instructor's appraisal of the student's ability. A space for evaluating the student's work habits, attitudes, and other characteristics is also provided. The form is similar to the Job Corps' Training Achievement Record for construction carpenter. Good idea for record keeping and evaluation purposes. RECOMMENDED.

Carpentry Job Knowledges, Job Skills, Performance Objectives and Learning Modules. Capital Area Career Center Performance-Based Carpentry Curriculum. 1972.

Capital Area Career Center
611 Hagadom Road
Mason, Michigan 48854

The Capital Area Career Center, which is part of the Ingham Intermediate School District, has developed task analyses, performance objectives, and learning modules for their three programs in construction which includes modular carpenter, rough carpenter, and pre-apprentice carpenter. Each module or learning package covers one task identified to be important for entry-level performance. The module consists of an identification, performance objective, [illegible] and equipment list, job sheets, and [illegible] with [illegible]. The [illegible] ranges in [illegible] and involves completion of a [illegible].

Carpentry Progress Record, Theory Outline and Job Assignment Plan Book. 1973. 41 pages.

Connecticut State Department of Education
Division of Vocational Education
Hartford, Connecticut 06115

The purpose of this booklet is to maintain a record of a student's progress through the entire three-year carpentry program. The instructor records all activities according to the instructional outline. This booklet will be combined with the Carpentry Trade Analysis to form a carpentry curriculum guide for the State's classroom teachers. RECOMMENDED.

Carpentry Trade Analysis. 1973. 95 pages.

Connecticut State Department of Education
Division of Vocational Education
Hartford, Connecticut 06115

A current, detailed trade analysis in carpentry, the guide, which is in the process of final revision, contains units on hand tools, portable power tools, stationary machines, fasteners, millwork, stairs, foundations, framing decks, wall framing, roof framing, exterior trim, roof coverings, flashing, exterior siding, stairs, insulation, dry wall construction, exterior trim, and kitchen cabinets.

Intended for use in senior high school, the guide has instructor guide sheets listing skills (or tasks), technical information, equipment and tools needed, safety factors, and skills needed in blueprint reading, math, and science for each task. RECOMMENDED.

Commercial Carpentry, 1974, Instructor's Manual, Student's Manual.

Curriculum and Instructional Materials Center
Oklahoma State Department of Vocational
and Technical Education
Stillwater, Oklahoma 74074

As a result of a cooperative effort between The Associated General Contractors of America and the Oklahoma Curriculum and Instructional Materials Center, this complete course of instruction was developed for the training of a commercial construction carpenter.

There are ten sections in the commercial carpentry curriculum: introduction; leadership; related information; tools; blueprint reading; site forming; framing; exterior finish; interior wall finish; and interior trim. Each section consists of one or more units of instruction. There are behavioral objectives, suggested activities for the teacher and students, information sheets, assignment sheets, job sheets, visual aids, criterion-referenced tests and test keys in each unit. A progress chart is included at the end of each section. There are well-done masters which may be used to make overhead transparencies or ditto masters. The tests cover the gamet from multiple choice to identification-type questions.

There is an instructor's manual ($20) and student's manual ($15) which are well-worth the price. It is probably the best work done thus far in the field of commercial carpentry, as attested to by many state department curriculum specialists and teachers. The section on forming is

especially well-done. The majority of carpentry books and catalogs only cover conventional forms, working with wooden curved surfaces, arches, and other commercial forms are highly recommended.

Competency-Based Vocational Education Curriculum Project for Kanawha County Vocational Centers. (In progress)

Fred W. Harrington
Coordinator, Curriculum Development
State Department of Education
Bureau of Vocational-Technical and Adult Education
Charleston, West Virginia 25305

Curriculum project on competency-based vocational education which is now in progress. Performance objectives, learning activities, and criterion-referenced evaluation measures are being developed in carpentry, as well as other areas within the building construction cluster.

Construction Learning Packets.

Continuing Education Publications
Extension Annex
Corvallis, Oregon 97331

These are 150 learning packets that deal with the construction cluster. Areas include: mathematics; hand tools; power tools; wood properties; concrete; fasteners; safety; measurement; foundations; blueprint reading; floor framing; insulation; siding; drywall; roofing; trusses; stairs; kitchen cabinets; pipe trades; and finishes.

Course of Study for Carpentry. 1973. 36 pages.

Trade and Industrial Education
Bureau of Vocational Education
Pennsylvania Department of Education
Harrisburg, Pennsylvania 17126

Included in this state guide are skill competencies and information lessons for nine units in carpentry. The units include: orientation; hand tool processes; building layout; foundation and concrete forms; floor framing; wall framing; roof framing; exterior finish; and interior finish. The guide is mainly a teaching aid to classroom teachers who can develop job, operation, information, and assignment sheets from the skill competencies listed.

ne I - 1968, 314 pages. Volume
ne III - 1970, 349 pages.)

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e the California State Carpenter's
tee's related training courses
y guides were developed for use
pentry apprentices. Volume I
he topics: the apprentice
rpentry mathematics; pre-job
ing; the plot plan; and
ch related instruction lesson
nation, an assignment, and study
are made from 12 texts, 6 of
tice should have. The others are
es. The guide is designed for
nducted by a qualified journeyman.
lude 38 architectural schematics
rint reading guide, and a
sed on architectural drawings.

ts on: rough framing; roof framing;
and stair building. The last
orm detailing, construction, and
ressed concrete; heavy lumber
the builder's level and level-

ical section in these workbooks,
to be self-administered to check
ing of the material. Upon
teacher-designed test is given
in the student's file and progress

entry Units Designed for
e Trades. 1970. 76 pages.

ucation
ducation

listing tasks, operations,
ngs for 13 instructional units:
aging and scaffolds; foundation
im; roofing; siding; insulation;
ring; interior finish; and
Also included is an occupation

chart which lists sixteen occupations within the carpentry field and the skills needed for each occupation.

An Exploratory Study to Analyze New Skill Content in Selected Occupations in Michigan and the Mechanism for its Translation into Vocational Education Curricula by Stephen D. Stuart, 1972. 263 pages.

Battelle Memorial Institute
Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

This project sought to develop a general methodology for designing curricula that eliminates descrepancies between the skills employers desire and those students acquire in vocational education courses, and to test the ability of research organizations to initiate curriculum change. Detailed task analyses and curriculum reviews revealed programs which were largely irrelevant to employer skill requirements, programs where students learned needed skills but did not achieve desired levels of proficiency, and programs that were wholly out-of-date.

Among the occupations studied was that of the construction carpenter. Included in the section on carpentry is a detailed analysis of the Job Analysis Interview Guide, a survey instrument which was sent out to construction contractors in the Mount Pleasant area of Michigan. Over 160 tasks which were deemed by the contractors to be important for entry-level employment were identified. An interpretation and recommendations are presented. A separate section report on the construction carpenter, including the entire survey instrument, can be obtained from Battelle Memorial Institute. RECOMMENDED.

An Exploratory Study to Analyze New Skill Content in Selected Occupations in Michigan and the Mechanism for its Translation into Vocational Education Curricula: Section Report on Construction Carpenter. 76 pages. 1972.

Battelle Memorial Institute
Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

A survey instrument called the Job Analysis Interview Guide was used to collect data from construction contractors located in the Mount Pleasant area of Michigan. Sixteen units or task classes were included on the survey instrument. These included: blueprints and specifications; framing and interior partitions; roof framing; stairs; insulation;

site preparation and layout; supplies; excavation; foundation construction; sheathing; roofing; exterior trim; interior trim; and miscellaneous. There were 262 separate tasks included in these units.

The report includes an analysis of the major findings, interpretation of the findings, and recommendations. The last 59 pages include the results of the survey instrument, item for item. Overall, a well-written and comprehensive analysis of carpentry in a specific location, although the findings may not be applicable to other locations.

RECOMMENDED.

Identification of Task and Knowledge Clusters Associated with Performance of Major Types of Building Trades Work by W. A. Bakamis, and others. Washington State University, Pullman, Washington. 1966. 184 pages. (ED 010 658)

Among the clusters of knowledge widely used by the building trades, 44 tasks were identified for the carpenter. A percentage of how many workers surveyed who performed each task is given in Appendix B. Other building trades are also analyzed in order to enable a student to enter several occupations with certain skills and knowledge.

Incentive Apprenticeship Program in Carpentry. 1974.

Manpower Development and Training Department
National Association of Home Builders
15th and M Streets, N. W.
Washington, D. C. 20005

A new concept in apprenticeship training is being introduced in 1974 by the National Association of Home Builders. The carpentry trade is divided into units of skills and knowledge, and manipulative and written tests have been developed. Under the Incentive Apprenticeship Program, evaluation of individuals with previous training and skills can be made. Objective tests to measure the trainee's mastery of specific skill tasks can be spaced out by the apprentice in accordance with his personal time table. Fast learners may be able to complete the training program in as short a time as one or two years, while slower learners might require five or six years to achieve the journeyman level of proficiency. Thus, this system hopes to reward an individual based on performance rather than length of time the individual has been on the job. For more detailed information write Mr. James Rushton or Mr. Philip Polivchak. RECOMMENDED.

Instructional Plans for the Construction Cluster: Volume II of the project report, "The Preparation of Curriculum Materials and the Development of Teachers for an Experimental Application of the Cluster Concept of Vocational Education at the Secondary School Level." 1967. 150 pages.

Industrial Education Department
J. M. Patterson Building
University of Maryland
College Park, Maryland 20742

As part of an extensive research project on the cluster concept in vocational education, instructional plans for the construction cluster were developed. The construction cluster contained the areas of carpentry, electricity, masonry, painting, and plumbing. Each area was developed to include tasks, areas of human requirement, teaching methods, and methods of evaluation.

The 41 pages in the carpentry section list 39 general tasks with several areas of human requirements under each task.

Job Cluster Curriculum for Construction Occupations at the High School Level. (In progress)

William Fitz
Texas Education Agency
201 East 11 Street
Austin, Texas 78710

This project's objective is to develop instructional materials for the cluster of construction. One phase of the program deals with an exploratory approach for 9th and 10th grades in seven broad areas including woods. The other phase is the development of psychomotor skills relevant to the specific job family.

There are instructor's guides and student resource manuals for both phases utilizing a format which emphasizes behavioral objectives, suggested activities, information sources, and related academic theory. The student resource manual for the first phase emphasizes occupational information, whereas the second phase manual provides basic technical information.

Validation will be completed by 1975.

Measureable Carpentry and Cabinet Making Objectives for Post-Secondary Technical Institutes/Technical Colleges. 1973. 51 pages.

Alabama State Department of Education
Vocational-Technical and Higher Education
Montgomery, Alabama 36104

This guide was prepared to assist administrators and instructors in developing a carpentry program for technical institutes or colleges in Alabama. It contains course outlines with listings of texts and references for major units, specific job skills, and evaluation procedures. There is an extensive listing of reference materials, including books, films, film loops, and transparencies contained in the appendices.

Methods for Curriculum Content Derivation. (In progress)

Dr. Frank C. Pratzner
Program Director
Methods for Curriculum Content Derivation
The Center for Vocational and Technical Education
Ohio State University
1960 Kenny Road
Columbus, Ohio 43210

The basic output of this research and development program will be a set of procedures to aid curriculum specialists in deriving performance-based curriculum content. Detailed procedures, along with illustrative materials, will be available in a set of procedures manuals. Performance content, as defined by job tasks and technical concepts, will be analyzed by an extension of the basic task inventory procedures originally developed by the U. S. Air Force. The procedures manuals are in the developmental stages and testing is planned in 1975.

National Apprenticeship and Training Standards for Carpentry. 1973. 35 pages.

U. S. Department of Labor
Manpower Administration
Bureau of Apprehticeship and Training
Washington, D. C. 20210

The revised national standards for carpentry apprenticeship encompass standards for carpentry, millwright, and mill-cabinet apprenticeships. The standards were developed to provide guidelines for establishing local systems of apprenticeship, as well as for advancing and improving existing systems. The term for carpentry,

millwright, and mill-cabinet apprentices is set for four calendar years with a required 144 hours of related classroom instruction each year. Some of the other standards established for each of the three fields include qualifications of apprenticeship, selection of apprentices, ratio of apprentices to journeymen, apprenticeship agreements, probationary periods, apprentice wages, periodical examinations, work experience, and certificates of program completion. The local joint apprenticeship committees, equally representative of management and labor, are responsible for adapting the national standards to local use. Trade experience schedules, related instruction outlines, recommended textbooks, and reference materials are given for each field. The standards are supplemented with the latest amendments and regulations of the various federal laws affecting apprenticeship, apprenticeship record keeping forms, and directories of regional and state apprenticeship agencies. RECOMMENDED.

Occupational Training Guides. 1974. 201 pages.

Chief of Vocational Training
Office of Program Development
Job Corps, Manpower Administration
U. S. Department of Labor
601 D Street, N. W.
Washington, D. C. 20217

A complete reference set of training guides is contained in this source. The information provides all Job Corps training staff with ready-reference of the minimum job entry-level requirements of training programs offered by Job Corps. Also included are references concerning employment data to assist staff in developing, implementing, and evaluating their programs. Among the 144 occupations is a guide for construction carpenter (D.O.T. No. 860.381). The guide lists training elements, proficiency level necessary, education and technical knowledge, job physical profile, and attitude and professional ethics. RECOMMENDED.

Performance-Based, Self-Paced, Individualized System Packaging. (In progress)

Burton Braverman
Kent County Vocational-Technical School
Dover, Delaware

A curriculum packaging system to assist a student in learning a vocational skill at a rate consistent with ability. The system will be completed and implemented by September 1975 with packages for each vocational trade area, including carpentry.

Performance Objectives for Carpentry and Job Competency List for Carpentry.

Learn Fast Systems
R. D. #2
Box 429
Yardville, New Jersey 08620

A commercial firm's list of carpentry performance objectives and job competencies. Not really worth the price ($25 and $10 respectively).

PLACE: The Development and Implementation of the PLACE (Planned Learning Activities for Career Education) System of Individualized Instruction for Ten Multioccupational Programs in the Area Comprehensive High Schools in Georgia. 1971-1973.

Dr. Nevin R. Frantz, Jr.
Associate Professor
Division of Vocational Education
University of Georgia
Athens, Georgia 30602

The purpose of this project was to develop and implement an instructional system which would enable students to acquire job-entry competencies for clusters of families or occupations on an individual basis. Carpentry is in the construction cluster, for which job-entry tasks were identified. PLACE instructional packages which contain performance objectives, multiple learning resource lists, instructional activities, and evaluation components have been developed. Instructor guides, teacher training materials, and media equipment lists have also been developed.

Project ABLE: The General Woodworking Core Curriculum. Project ABLE: Development and Evaluation of an Experimental Curriculum for the New Quincy (Mass.) Vocational-Technical School by Frank E. Leoprini, Glen E. Nelfeig, and J. William Ullery. 1970. 209 pages. (ED 045 854)

American Institutes for Research
Pittsburgh, Pennsylvania

This report describes the development of Project ABLE's General Woodworking Core Curriculum and is intended as an administrator's and instructor's manual for those schools field testing the instructional system. In the developmental process, analysis of a large number of occupations related to the woodworking family identified clusters or sub-families which were then analyzed for

common skills and knowledges. Job descriptions and task enumeration were followed by task descriptions and analyses, and performance objectives, derived from tasks and analyses, were translated into criterion tests called performance evaluation sets. To meet a major project objective of individualized instruction, learner activity guides, which include student-instructor options for selecting media and methods of instruction to meet individual needs, were developed. Additional documentation of other developmental efforts was also analyzed.

The following is a breakdown of the task analyses. There are 101 general carpentry tasks for construction technician, floor layer, inside finishman, outside finishman, framer, lather, siding applicator, tile applicator, cobbler, and roofer. There are 75 mill carpentry tasks for assemblyman, boat builder, cabinet installer, formica installer, furniture maker, hardware applicator, interior designer, kitchen cabinetmaker, layout man, millman, millman/wood former, paint and stain maker, sash and door carpenter, spray and finisher, and wood turner. Another 65 basic woodworking tasks are also described.

See ED 042 920 and ED 030 721 for more detailed information about Project ABLE.

Project ABLE General Woodworking Curriculum. (Interim project) (ED 030 721)

A sample of student tasks and topic objectives which were developed for woodworking courses in Project ABLE are given. A larger collection of the above were identified for grades 10, 11, and 12. Prior to this activity, an analysis of selected occupations was made, and a frequency count of skills and knowledges was utilized to determine the necessary objectives relative to selected woodworking occupations.

Project CAREER (Computer Assisted Research for Education Relevance). (In progress)

Vincent P. Lamo
Director, Project CAREER
301 North Main Street
Randolph, Massachusetts 02368

Project CAREER is a federally-funded research and development grant administered by the Division of Occupational Education, Massachusetts Department of Education. As part of the project's activities, a computerized data bank of occupational performance objectives can be obtained for occupational areas such

as carpentry. For each objective, the following elements are included: necessary prerequisite competencies, component skills or procedures for attaining the target objective; environmental variations within and/or through which to learn the objective, and related concepts which could be taught in conjunction with the objective. There is also a coding process for the handicapped which identifies those objectives which can be performed by certain classes of handicapped students.

The performance objectives were developed through a system of conversion and validation by educators, curriculum specialists, and tradesmen.

Residential Carpentry by Wayman R. Penner. 1973. 1027 pages.

Curriculum and Instructional Materials Center
Oklahoma State Department of Vocational
and Technical Education
Stillwater, Oklahoma 74074

Similar to Commercial Carpentry, this comprehensive manual deals with entry-level tasks of residential carpentry. The manual is modular in nature, with units containing behavioral objectives, suggested activities, information sheets, transparency masters, job sheets, assignment sheets, and tests and answer keys. Supplemented by an instructor's methods and materials, this source is a very valuable aid to ensure a standardized instructional program for prospective residential carpenters. Well worth the $15. HIGHLY RECOMMENDED.

Residential Construction: Carpentry Trade Analysis. (In progress)

Instructional Materials Laboratory
Trade and Industrial Education
Ohio State University
1885 Neil Avenue
Columbus, Ohio 43210

Currently finalizing an analysis of the carpentry trade as it relates to new residential construction. Will be completed in the later part of 1974.

Roofers Learner's Manual. n.d. 357 pages.

Trade and Industrial Education Service
Vocational Education Division
Ohio State Department of Education
Columbus, Ohio 43215

Sanford Research Project. Carpentry Unit and Task Packages, Behavioral Objectives, and Carpentry Competencies. 1972.

Sanford Central High School
1708 Nash Street
Sanford, North Carolina 27330

The Sanford Research Project focused upon the development of individualized instructional materials for vocational education programs offered at Sanford Central High School. Career competencies, behavioral objectives, and individualized learning packages have been completed for many occupational areas, including carpentry.

The occupational cluster of carpentry materials consist of units on carpentry hand tools; portable power tools; woodworking machine tools; lumber; fasteners and adhesives; plans, specifications, and codes for houses; footings and foundations for a house; household cabinets; floor framing for a house; wall framing; roof framing; exterior wall finish; interior walls, ceiling, and floor finish; and door and interior trim.

There is a unit package for each of the aforementioned 14 topics containing required prerequisites, rationale for the unit, and general objectives of the unit. Specific performance objectives, learning activities, and learning practices are then contained in task packages for the student to complete. There are 97 carpentry tasks contained in the entire carpentry cluster.

The objectives and learning activities are very specific and specialized to meet the needs and utilize the facilities of Sanford Central High School, North Carolina. RECOMMENDED.

Scope of the Written and Performance Test in Carpentry. 1974. 7 pages.

National Occupational Competency Testing Institute
Educational Testing Service
Princeton, New Jersey 08540

This booklet describes the National Occupational Competency Testing Institute's written and performance examination for carpentry. As stated in the introduction,

the examination may be used, in conjunction with other criteria, for one of the following reasons: admission to trade and industrial/technical teacher education programs; to meet certification requirement for an industrial teacher; to establish evidence of occupational competence for advanced standing in undergraduate or graduate programs of study; and to get objective evidence of one's competence for a job in industry.

The written examination takes three hours and covers: surveying, layout, and blueprint reading; foundation work; concrete works; floor and steps construction; floor framing; wall and ceiling frame; roof framing; roofing; stair construction; exterior finish; interior finish; carpentry; insulation, ventilation, and acoustical treatment; scaffolding; and estimating.

The performance examination takes five hours and covers: floor framing; wall framing; roof framing; exterior finish; and roofing.

Secondary Vocational Building Trades. 1971. 122 pages.

Mississippi State University
Research and Curriculum Unit
for Vocational-Technical Education
Mississippi State, Mississippi 39763

Contains assignment and job sheets which may be used by teachers for different tasks. Each assignment sheet states objectives, introductory information, references, topics for special emphasis, and the problem assignment. A corresponding job sheet contains an objective, introductory information, equipment and tools, procedures, a working drawing, and statement of the problem.

Selected Information Resources on Vocational Education. 1973.

National Reference Center
Science and Technology Division
Library of Congress
Washington, D. C. 20540

A description of 32 organizations which provide information on vocational education. Addresses, phone numbers, and a brief description of services are given.

Selected Information Resources on Wood Products. 1973. 12 pages.

National Reference Center
Science and Technology Division
Library of Congress
Washington, D. C. 20540

Contains 47 organizations where wood products information may be obtained. Each organization's address and phone number, along with a brief description of their services, is given.

A Suggested Basic Course Outline for Building Trades. 1970. 97 pages.

Vocational Instructional Services
Vocational Industrial Education
Texas A&M University
College Station, Texas 77843

Mainly concerned with the functions of the carpenter and painter. The building trades are broken down into three major blocks: foundation; framing; and interior and exterior trim. Each block contains tasks, behavioral objectives, related knowledge, task details, suggestions for teaching, and references and aids. The guide is written in outline form and is to be used only as a starting point to develop a functional course of study.

A Suggested Course Outline for Building Trades. n.d. 54 pages.

New Mexico Department of Education
Vocational-Technical Division
Santa Fe, New Mexico 87501

Contains a brief topical course outline for the building trades. Also has a carpentry equipment list and procedures for planning trade facilities.

TIMES Project (Temporally Individualized Modular Education Scheduling). 1972.

Admiral Peary Area Vocational-Technical School
Research Coordinating Unit
P. O. Box 96
Ebensburg, Pennsylvania 15971

The chief goal of this project was to develop a computerized system for coordinating occupations listed in

The Dictionary of Occupational Titles with educational modules in each vocational area of instruction. The study was conducted by the Admiral Peary Vocational-Technical School for their 20 programs, one of which is carpentry. Program Study Sheets were developed which contain occupational descriptions, a list of potential local employers, a list of required tasks, and other elective and career-tasks that should be completed. These sheets are used by the individual instructor to develop Task Instruction Sheets which contain the major task learning objectives, background information, procedures, materials and supplies, safety precautions, review questions, and references. The carpentry area has been broken down into 11 units, 40 modules, and over 100 individual tasks. The TIMES concept is currently being utilized at Admiral Peary and it appears to be a highly individualized and flexible program of carpentry instruction. The program is performance-based, open-entry, and modular to allow a student to progress at his own rate. RECOMMENDED.

Training Achievement Records. 1974.

Chief of Vocational Training
Office of Program Development
Job Corps, Manpower Administration
U. S. Department of Labor
601 D Street, N. W.
Washington, D. C. 20213

This booklet contains 144 Training Achievement Records which are to be used in conjunction with the Occupational Training Guides for record keeping purposes. The achievement record for the construction carpenter consists of 43 occupational tasks. The forms also include information about the student's educational and technical knowledge, job physical profile, attitudes and professional ethics, and proficiency level. RECOMMENDED.

United Brotherhood of Carpenters and Joiners of America
101 Constitution Avenue, N. W.
Washington, D. C. 20001

The United Brotherhood of Carpenters and Joiners of America is a national association which is involved in the apprenticeship program of carpenters, cabinet makers, and millwrights. It also offers training to journeyman carpenters in order to upgrade their present abilities and skills, and sets up new training programs to inform carpenters of innovations in the field. This organization produces many instructional materials but most of them are only available to members of their organization or councils.

Vocational Building Trades Curriculum Guide. 1972. 62 pages.

Virginia State Department of Education
Division of Vocational Education
Richmond, Virginia 23216

Developed by a group of building trades instructors, this curriculum guide is intended for use primarily by instructors in day trades classes at the 10th, 11th, and 12th grade levels. The purpose of the building trades cluster curriculum is to prepare the students to enter the construction industry with sufficient skills in several related trades to be competent assistants to skilled tradesmen. Emphasizing light or residential-type construction, the guide may be used over a two-year period for a total of 1080 hours of instruction. Based on a time block organization, the guide offers suggestions for teaching units, types of classroom activities, and a coded listing of instructional aids. Sample lesson plans, information sheets, and job sheets are included in the appendices.

Vocational Carpentry Curriculum Guide. 1973. 145 pages.

Trade and Industrial Education Service
Division of Vocational Education
Virginia State Department of Education
Richmond, Virginia 23216

Similar to other state curriculum guides in that it contains a job description, units of instruction, lesson plan examples, and a list of instructional materials. The 11 suggested units of instruction are: orientation; hand and power tools; foundation and forms; floor and wall framing; roof framing; roof covering; exterior wall finishes and trim; insulation, interior wall and ceiling finishes; interior trim; stair building; and pre-employment. Each unit contains information to be conveyed, skill-development activities, and instructional aids which could be used. Sample information sheets are contained in the appendices.

Vocational-Technical Education Consortium of States (V-TECS) Curriculum Project. (In progress)

Vocational-Technical Education Consortium of States
Commission on Occupational Education Institutions
Southern Association of Colleges and Schools
795 Peachtree Street, N. E.
Atlanta, Georgia 30308

An extensive and comprehensive curriculum project is currently being carried out by member states of the

Vocational-Technical Education Consortium of States (V-TECS). V-TECS was formed by seven states on July 1, 1973. The seven states involved are Alabama, Florida, Georgia, Kentucky, Mississippi, Texas and Virginia. The fundamental purpose of V-TECS is to develop catalogs of performance objectives and criterion-referenced measures in occupational education. V-TECS is developing objectives based upon a uniform procedure consisting of: (1) development of task statement booklets by a domain of job titles; (2) selection of a representative random sample of incumbent workers within the state which is developing the catalog; (3) administration of the task statement booklets to the incumbent worker sample; (4) computerized analysis of information collected from the sample in terms of time spent on tasks, difficulty of tasks, etc.; (5) conversion of the task statements into performance objectives with companion criterion-referenced measures; and (6) a comprehensive field test and dissemination program.

Each state is required to develop two areas in occupational education. Catalogs and materials will be shared by the Consortium members.

The state in charge of developing the area of carpentry is Kentucky. The contact person and address is:

Mr. Robert Spillman, Director
Personnel Development Unit
Bureau of Vocational Education
2035 Capital Plaza Tower
Frankfort, Kentucky 40601

It should be emphasized, however, that only member states will receive resultant materials. For further information of V-TECS, contact Mr. Ben A. Hirst, Jr. at the above address in Georgia

ADDENDUM

Directory of Task Inventories, Volume I. 1974

Task Inventory Exchange (TIE)
The Center for Vocational Education
The Ohio State University
1960 Kenny Road
Columbus, Ohio 43210

The Task Inventory Exchange's purpose is to increase the availability and sharing of task inventories in order to minimize the duplication of effort in their development and maximize the use of existing ones. This first directory has a compilation of task inventories for nearly 350 job titles, including carpentry. Volume II is expected to be published in December, 1975.

REFERENCES

A comprehensive list of books, alphabetized by title, is included in this section. More information on the publications can be obtained by writing directly to the publisher or producer. Addresses appear in the source listing at the end of this section.

Unfortunately, this list is not annotated, so it is strongly advised that descriptive literature and an examination copy be requested on school stationary for evaluation before purchasing any publication.

Accident Prevention Manual for Shop Teachers
by William A. Williams
American Technical Society

Acoustical Manual, Apartment and Home Construction
National Association of Home Builders

Advanced Woodworking and Furniture Making
Chas. A. Bennett Company

Apprenticeable Trade, 1973
Chronicle Guidance Publications

Architectural and Building Trades Dictionary, 3rd ed.
by Robert Putnam and G. E. Carlson
American Technical Society

Blueprint Reading for the Construction Trades, 1972
by H. F. Bellis and W. A. Schmidt
McGraw-Hill Book Company

Builders Encyclopedia
by Harry Ulrey
Theodore Audel and Company, Division of Howard W. Sams

Building and Construction Estimating, 1971
by George H. Cooper and Stanley Badzinski, Jr.
McGraw-Hill Book Company

Building Construction Roof Framing, 1960
by Alonzo Wass and Gordon A. Sanders
Prentice-Hall

Building Maintenance, 1968
by Jules Oravetz, Sr.
Theodore Audel and Company, Division of Howard W. Sams

Bench Woodwork, 1972
by John L. Feirer
Chas. A. Bennett Company

Building Materials Technology and Selling, A Distributive Education Manual and Answer Book
University of Texas

Building Terms and Definitions
by Herbert R. Waugh and Nelson L. Burbank
Simmons-Boardman Publishing Corporation

Building Trades Blueprint Reading, Part I (Fundamentals), 5th ed., 1972
by Elmer W. Sundberg
American Technical Society

Building Trades Blueprint Reading, Part II (Residential and Light Commercial Construction), 2nd ed., 1974
by Elmer W. Sundberg
American Technical Society

Building Trades Blueprint Reading, Part III (General Construction, Specifications, and Heavy Construction)
by Elmer W. Sundberg
American Technical Society

Building Trades Blueprint Reading Examination Kit
by William Woltjes
American Technical Society

Building Trades Blueprint Reading and Sketching
Delmar Publishers

Cabinetmaking and Millwork, 1967
by John L. Feirer
Chas. A. Bennett Company

Cabinetmaking and Millwork: Tools, Materials, Layout, Construction, 2nd ed., 1968
by Alf Dahl and J. Douglas Wilson
American Technical Society

Carpenter Study Manual, 1973
University of Texas

Carpentered Hen
by John Updike
Harper and Row Publishers

Carpenters and Builders Guide, Volumes I, II, III, IV, 1968
by Harry F. Ulrey
Theodore Audel and Company, Division of Howard W. Sams

Carpenters Tools, Their Care and Maintenance
Drake Publishers

Carpenters, U. S. Safety Bulletin #1118
by McElroy, Frank Shafer and George R. McCormach
U. S. Bureau of Labor Statistics
Department of Labor

Carpentry
by R. J. Cristoford
Arco Publishing Company

Carpentry
Apprenticeship and Training Department
United Brotherhood of Carpenters and Joiners of America

Carpentry, Units I through XII; Plan A, Plan B, and Plan C
Apprenticeship and Training Department
United Brotherhood of Carpenters and Joiners of America

Carpentry Mathematics
Apprenticeship and Training Department
United Brotherhood of Carpenters and Joiners of America

Carpentry and Building, 1966
by Harry F. Ulrey
Theodore Audel and Company, Division of Howard W. Sams

Carpentry Blueprint Interpretations
New Jersey Vocational-Technical Curriculum Laboratory

Carpentry Blueprint Reading and Sketching - Residential
by Leo P. McDonnell
Delmar Publishers

Carpentry for the Building Trades, 2nd ed.
by Elbert A. Lair
McGraw-Hill Book Company

Carpentry Craft Problems, A Complete Practical Book of Instruction, 1963
by H. H. Siegele
Drake Publishers

Carpentry I - House Framing
New Jersey Vocational-Technical Curriculum Laboratory

Carpentry and Joinery
by W. B. Douglas
P. Shalon Publications

Carpentry in Residential Construction
Prentice-Hall

Carpentry in Commercial Construction, 1974
by Stanley Badzinski
Prentice-Hall

The Complete Book of Woodworking and Cabinetmaking, 1974
by Byron W. Maguire
Prentice-Hall

Concrete Construction Handbook
by Joseph D. Waddepp
McGraw-Hill Book Company

Concrete Form Construction
Delmar Publishers

Constructing and Manufacturing Wood Products
by Wayne Zook
McKnight Publishing Company

Construction Estimating
by R. Jones
Delmar Publishers

Construction Estimating and Costs, 4th ed.
by Harry Pulver
McGraw-Hill Book Company

Construction Estimating and Job Preplanning
by George E. Deatherage
McGraw-Hill Book Company

Construction Estimates from Take-Off to Bids
by Norman Foster
McGraw-Hill Book Company

Construction Principles, Materials, Methods, 1970
by J. L. Schmidt, W. H. Lewis and H. B. Olin
American Savings and Loan Institute Press

Construction Safety Rules and Regulations, Bulletin #259, 1969
U. S. Department of Labor

Course in Carpentry, Volume I (Workbook and Testbook), 1968
California State Department of Education

Course in Carpentry, Volume II (Workbook and Testbook), 1969
California State Department of Education

Course in Carpentry, Volume III (Workbook and Testbook), 1970
California State Department of Education

Cyclopedia of Building Terms
Building Materials Merchandiser

Design and Production of Houses
by Burnham Kelly
McGraw-Hill Book Company

Design of Concrete Structures
by George Urquhart
McGraw-Hill Book Company

Design of Foundations for Buildings
by Sidney M. Johnson and Thomas C. Kavanagh
McGraw-Hill Book Company

Design of Prestressed Concrete Beams
by W. H. Connolly
McGraw-Hill Book Company

Design of Wood Formwork for Concrete Structure, #3
National Lumber Manufacturers' Association

Design of Wood Structures for Permanence, #6
National Lumber Manufacturers' Association

Dictionary of Occupational Titles, Volumes I and II, 1967
U. S. Department of Labor

Elementary Structural Design
by Charles O. Harris
American Technical Society

Estimating for the Building Trades, 2nd ed., 1967
by Joseph Steinberg and Martin Stempel
American Technical Society

Exploring Woodworking
by Fred W. Zimmerman
Goodheart-Willcox Company

Finishing Technology, 3rd ed., 1969
by George A. Soderberg
McKnight Publishing Company

Foundation Construction
by Arthur B. Carson
McGraw-Hill Book Company

Framework for Concrete Structures, 1964
by R. L. Peurifoy
McGraw-Hill Book Company

Framing, Sheathing, and Insulation
by R. Jones
Delmar Publishers

The Framing Square
New Jersey Vocational-Technical Curriculum Laboratory

Fundamentals of Carpentry: Volume I, Tools, Materials, Practices, 4th ed., 1969
by Walter Durbahn
American Technical Society

Fundamentals of Carpentry: Volume II, Practical Construction, 4th ed., 1970
by Walter Durbahn and Elmer W. Sundberg
American Technical Society

General Woodworking
McGraw-Hill Book Company

General Shop Bench Woodworking, 4th ed., 1955
by Verne C. Fryklund and Armand J. LaBerge
McKnight Publishing Company

General Shop Woodworking, 7th ed., 1972
by Verne C. Fryklund and Armand J. LaBerge
McKnight Publishing Company

Grading Rules for Western Lumber, 2nd ed.
Western Wood Products Association

Guide tc Plywood Grades
Georgia-Pacific Company

Hand Woodworking Tools, 1962
by Leo P. McDonnel
Delmar Publishers

Heavy Timber Construction, 1968
by Fred R. Oberg
American Technical Society

Heavy Timber Construction Details, #5
National Lumber Manufacturers' Association

House Framing, #1
National Lumber Manufacturers' Association

Industrial Arts Woodworking, 1972
by John L. Feirer
Chas. A. Bennett Company

Insulation Manual for Houses and Apartments, 1971
National Association of Home Builders, Research Foundation

Insulation of Wood Frame Structures, #7
National Lumber Manufacturers' Association

Interior and Exterior Trim, 1962
Delmar Publishers

Job Corps Training Standard for Construction Carpenter, 1974
Job Corps
Department of Labor

Light Frame House Construction
U. S. Department of Commerce
National Committee on Wood Utilization

Looking Forward to a Career: Building Trades, 1970
Dillon Press

Machine Woodworking, 3rd ed., 1958
by Robert E. Smith
McKnight Publishing Company

Manual of Accident Prevention in Construction, 1971
The Associated General Contractors of America

Manual of Carpentry
American Steel and Wire Division
United States Steel

Manual for House Framing
National Lumber Manufacturers' Association

Manual of Lumber and Plywood Saving Techniques for Residential Light-Frame Construction, 1971
National Association of Home Builders, Research Foundation

Manufacture, Selection, and Application of Asphalt Roofing and Siding Products, 1969
by J. L. Strahan
Asphalt Roofing Manufacturers Association

Manufacturing and Constructing Wood
McKnight Publishing Company

Materials of Construction, 1966
by Ronald C. Smith

Materials and Methods for Contemporary Construction, 1974
by C. Hornbostel and William J. Hornung
Prentice-Hall

Methods and Materials of Residential Construction, 1973
by Alonzo Wass
Prentice-Hall

Minimum Property Standards, (FHA Number 300)
Federal Housing Administration
U.S. Department of Housing and Urban Development

Modern Carpentry, 1973
by Willis H. Wagner
Goodheart-Willcox Company

Modern Machine Woodworking
Bruce Publishing Company

Modern Wood Technology, 1968
by Donald F. Hackett and Patrick E. Spielman
Bruce Publishing Company

Modern Woodworking, 1974
by Willis H. Wagner
Goodheart-Willcox Company

Noise Control with Insulation Board for Homes, Apartments, Motels, and Office Fundamentals of Building Insulation
Insulation Board Institute

Occupational Briefs--Construction Industry
Chronical Guidance Publications

Occupational Outlook Handbook
U. S. Department of Labor
Bureau of Labor Statistics

Operation of Modern Woodworking Machines, 1966
by Herman Jjorth and William F. Holtrop
Bruce Publishing Company

Painting and Decorating Encyclopedia, 1973
by William Bushwell
Goodheart-Willcox Company

Plan Reading for Home Builders, 1971
by J. Ralph Dalzell
McGraw-Hill Book Company

Plank and Beam Framing for Residential Buildings, #4
National Lumber Manufacturers' Association

Plywood Construction Guide for Residential Building
American Plywood Association

Portable Power Tools, 1962
by Donald M. Kidd and Louis J. Siy
Delmar Publishers

Power Tool Maintenance, 1971
by Daniel W. Irvin
McGraw-Hill Book Company

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Practical Carpentry, 1963
by Floyd M. Mix and Ernest H. Cirou
Goodheart-Willcox Company

Practical House Carpentry, Methods for Building, 1957
by J. D. Wilson
McGraw-Hill Book Company

Practical Problems in Mathematics for Carpenters
by Jack Luy
Delmar Publishers

Principles and Practices of Light Construction, 2nd ed., 1963
by Ronald C. Smith
Prentice-Hall

Principles and Practices of Heavy Construction, 1970
by Ronald C. Smith
Prentice-Hall

Principles of Woodworking
Bruce Publishing Company

Questions and Answers for Carpenters and Builders, 1966
by Harry F. Ulrey
Theodore Audel and Company, Division of Howard W. Sams

Related Drawing - Building Construction
New Jersey Vocational-Technical Curriculum Laboratory

Related Math - Building Construction, Teacher Guide
New Jersey Vocational-Technical Curriculum Laboratory

Related Mathematics for Carpenters, 2nd ed.
by P. Reband
American Technical Society

Related Science - Building Construction
New Jersey Vocational-Technical Curriculum Laboratory

Revolution in Roofing
Philip Carey Corporation

Safety and Health Regulations for Construction, #75
U. S. Department of Labor
Bureau of Labor Statistics

Simplified Roof Framing, 2nd ed.
by J. Douglas Wilson and S. O. Werner
McGraw-Hill Book Company

Simplified Stair Layout, 2nd ed.
by J. Douglas Wilson and S. O. Werner
Delmar Publishers

Stair Layout (Design and Building)
by Stanley Bradzinski, Jr.
American Technical Society

Stanley Tool Guide, 1972
Stanley Tools Division

Steel Square
by H. H. Seigele
Drake Publishers

Steel Square, 2nd ed., 1966
by Gilbert Townsend
American Technical Society

Study Guide for Steel Square, 1966
by R. W. Battenberg
American Technical Society

Techniques of House Nailing
U. S. Department of Agriculture

Technical Woodworking, 1966
by Chris H. Groneman and Everett R. Galzener
McGraw-Hill Book Company

Top Hand in the Building Trades: Carpentry as a Career
United Brotherhood of Carpenters and Joiners of America

Understanding the Construction Industry
KDI Instructional Systems

Uniform Building Code, Volume I, 1964
International Conference of Building Officials

Uniform Building Code, Volume VI, 1967
International Conference of Building Officials

Units in Woodworking, 1967
by J. H. Douglass, Forest L. Penny and R. H. Roberts
Delmar Publishers

Use of Hand Woodworking Tools, The
by Leo P. McDonnell
Delmar Publishers

Use of Portable Power Tools, The
by Leo P. McDonnell
Delmar Publishers

Wood Finishing Plain and Decorative
Drake Publishers

Wood-Frame House Construction, Agriculture Handbook #73
by L. O. Anderson and O. C. Heyer
U. S. Department of Agriculture

Wood Laminating, 1963
by J. Hugh Capron
McKnight Publishing Company

Woodturning, 1970
by Eldon Rebhorn
McKnight Publishing Company

Woodwork Standards and Specifications
National Woodwork Manufacturers' Association

Woodworking for Industry, 1971
by John L. Feirer
Chas. A. Bennett Company

Woodworking Technology, 3rd ed., 1972
by James J. Hammond, Edward T. Donnelly, Walter F. Harrod and Norman A. Rayner
McKnight Publishing Company

Woodworking With Machines, 1960
by J. H. Douglass
McKnight Publishing Company

World of Construction, The
by D. G. Lux and W. E. Ray
McKnight Publishing Company

SOURCE LISTING

Arco Publishing Company, Inc.
219 Park Avenue, South
New York, New York 10003

American Plywood Association
c/o Rarig Presentation Services
2100 North 45th Street
Seattle, Washington 98103

American Savings and Loan Institute Press
111 East Walker Drive
Chicago, Illinois 60601

American Steel and Wire Division
Literature Department
United States Steel
Rockefeller Building
Cleveland, Ohio 44113

American Technical Society
848 East 58th Street
Chicago, Illinois 60637

Asphalt Roofing Manufacture's Association
757 Third Avenue
New York, New York 10017

The Associated General Contractors of America
1957 E Street, N. W.
Washington, D. C. 20006

The Bruce Publishing Company
866 Third Avenue
New York, New York 10022

California State Department of Education
Bureau of Industrial Education
721 Capitol Mall, Room 414
Sacramento, California 95814

Chas. A. Bennett Company, Inc.
809 West Detweiller Drive
Peoria, Illinois 61614

Chronicle Guidance Publications, Inc.
Moravia, New York 13118

Delmar Publishers, Inc.
Mountainview Avenue
Albany, New York 12205

Dillon Press
106 Washington Avenue, North
Minneapolis, Minnesota 55401

Drake Publishers
381 Park Avenue South
New York, New York 10016

Goodheart-Willcox Company, Inc.
18250 Harwood Avenue
Homewood, Illinois 60430

Harper and Row Publishers, Inc.
49 East 33rd Street
New York, New York 10016

International Conference of Building Officials
50 South Los Robles
Pasadena, California 91101

Insulation Board Institute
111 Washington Street
Chicago, Illinois 60602

KDI Instructional Systems, Inc.
1810 MacKenzie Drive
Columbus, Ohio 43220

McGraw-Hill Book Company
1221 Avenue of the Americas
New York, New York 10020

McKnight Publishing Company
P. O. Box 854
Bloomington, Illinois 61701

National Association of Home Builders
15th and M Streets, N. W.
Washington, D. C. 20005

National Association of Home Builders
Research Foundation
Box 1627
Rockville, Maryland 20853

National Lumber Manufacturers' Association
1319 18th Street, N. W.
Washington, D. C. 20406

National Woodwork Manufacture's Association
400 West Madison Street
Chicago, Illinois 60606

New Jersey Vocational-Technical Curriculum Laboratory
Rutgers University
4103 Kilmer Campus
New Brunswick, New Jersey 08903

Philip Carey Corporation
Department HH - 669
Cincinnati, Ohio 45215

Prentice-Hall, Inc.
Educational Book Division
Englewood Cliffs, New Jersey 07632

P. Shalon Publications, Inc.
5409 18th Avenue
Brooklyn, New York 11204

Simmons-Boardman Publishing Corporation
350 Broadway
New York, New York 10013

Stanley Tools Division
The Stanley Works
New Britain, Connecticut 06051

Theodore Audel and Company
Division of H. W. Sams Company, Inc.
4300 West 62nd Street
Indianapolis, Indiana 46206

United Brotherhood of Carpenters
and Joiners of America
101 Constitution Avenue, N. W.
Washington, D. C. 20001

University of Texas
Instructional Material Services
Division of Extension
Austin, Texas 78712

U. S. Department of Agriculture
Office of Information
Photographic Division
Washington, D. C. 20250

U. S. Department of Housing and
Urban Development
Federal Housing Administration
Washington, D. C. 20036

U. S. Department of Labor
Bureau of Labor Statistics
Washington, D. C. 20212

Western Wood Products Association
700 Yeon Building
Portland, Oregon 97204